Crime Buster Application

Testing Report

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Presented to

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25 April 2018

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# 1. Introduction

## 1.1 Purpose of This Document

This document is intended for system administrators, quality assurance teams, and other users interested in reviewing the test procedure used in developing the first version of the Crime Buster web application. This report describes and analyzes the testing process as well as the results from the testing process.

## 1.2 References
1. Crime Buster System Requirements Specification Document

# 2. Testing Process

## 2.1 Description

The use cases described in the SRS documentation influenced each iterative and incremental development (IID) testing procedure. Team members were tasked with verifying specific test conditions derived from the original use cases. Accomplishing the verification of each of these test conditions drove the project development and allowed us to be confident in the next iteration, coding a larger piece of the Crime Buster web application.

There was further testing for the website that is not described and was beyond the planned test conditions. The testing technique followed for the iterative and incremental process is as follows: design, implement, test, repeat. For example, when testing the use cases for filtering correctly, at first the logic for the SQL query was incorrect (design flaws using OR's instead of a nested query). So, we went back to the design phase, came up with a new strategy to implement and test. The process is repeated until the desired result is verified. Once each of the use cases were verified, the final product was tested for it's requirements such as load time.

This is the general process we followed for the development of our website. We are still in the development phase and have not verified all of the requirements. It follows that the test results may change before the completion of the website.

## 2.2 Testing Sessions

| Date | Location | Time Started | Time Ended | Performed By | Use Cases |
|---|---|---|---|---|---|
| 4/07/18 | Home | 7:00pm | 8:00pm | Angel Cheng | Load the web application |
| 4/25/18 | UMBC Library | 3:00pm | 5:00pm | Katelyn Seitz | Visualization type selection |
| 4/25/18 | UMBC Library | 3:00pm | 5:00pm | Katelyn Seitz | Display tooltips |
| 4/21/18 | UMBC Library | 12:00pm | 2:00pm | Sam Mendimasa | Enter/Display a comment for a Crime |
| 4/21/18 | UMBC Library | 2:00pm | 4:00pm | Sam Mendimasa | Display all comments for a Crime |
| 4/21/18 | UMBC Library | 12:00pm | 3:00pm | Angel Cheng | Zoom in and out on a map view |
| 4/21/18 | UMBC Library | 10:00am | 3:00pm | Zach Vance | Filter the data based on crime type / Filter the data based on the date/time the crime was committed |
| 4/23/18 | Home | 5:00pm | 7:30pm | Zach Vance | Filter the data based on the location (District) / Filter the data based on Weapons |

## 2.3 Impressions of the Process

We believe our testing process is the most effective way to go about testing the web application. It is effective because it allows you to focus on a smaller section of code at one time, making it easier to debug. The code rarely works the first time, and when you program incrementally,

when it does not work, you know exactly where the problem is within your code since you are building off of code you know for a fact works perfectly. Prior to testing, the quality of the program is not the best as there are bugs that exist in the code. After repairs are made the quality goes up dramatically as it is updated to handle any of the test cases. Therefore, the testing process allowed us to find what code worked and what did not work so that we could repair as necessary and ultimately create the best web application possible.

We believe the best modular unit in the program is the implementation of data retrieval from the database. The web application connects to a large database of crimes and through the use of SQL queries, it is able to retrieve information from that database. For example, the sidebar of filters updates the array of crimes being used by all of the data visualizations currently displayed on the screen. The SQL queries retrieve the correct crimes from the database based on the selected filters from the sidebar. Much time and testing went into making sure these queries run perfectly as this affects the entire display of correct information to the web page. For this reason, we choose the retrieval of information from the database to be the "best" modular unit in the program as it has a small likelihood of containing flaws.

We believe the "worst" modular unit in our program is currently the bar / line graphs. This is because we are concerned about the usability of this feature for the web application. We are able to create a bar / line graph but want to format it in the most useful way to police officers. One of the pieces we are concerned with is giving the officer enough flexibility to create the exact graph they desire. After going through the process of creating a graph, we are unsure if it is flexible enough or if in some situation an officer may desire a different graph. So, in terms of usability we are most concerned with the bar / line graphs as the likelihood of remaining flaws overall is higher than in the other areas of our website.

## 3. Test Results

### 3.1 Testing Suite
The description of how testing was partitioned and implemented is outlined below.

| Use Case | Load the web application |
|---|---|
| Valid Loading Page Situation | User click on the link on on any device (phone, any computer), the page loads successfully. |
| Invalid Loading Page Situation | User has no internet connection. |
| Purpose | To test if the page can sucessfully load on any |

| | device (Windows/Mac web page, Cellphone) |
|---|---|
| Expected Results for Valid Situation | On any device, the web page loads successfully with all the filters and visualization types selected. |
| Expected Result for Invalid Situation | No internet connection notification from the web page. |
| Boundary condition | Losing internet connection after getting into the page will cause the web app lose all functionality. |

| **Use Case** | **Clear All/Select All** |
|---|---|
| Valid Account Details Situation | User clicks on select all button to check all filters. User clicks clear all button to uncheck all filters. |
| Purpose | To ensure that visualizations are either all full or all empty. |
| Expected Results for Valid Situation | User is able to see either all data in each visualization or all visualizations cleared of data. |
| Boundary condition | User clicks select all when all filters are already selected or clear all when filters are all unselected. |

| **Use Case** | **Visualization type selection** |
|---|---|
| Valid Type Selection Situation | User selects any combination of visualizations to be displayed or hidden. |
| Purpose | To let the user customize how the data is presented and derive different information. from it |
| Expected Results for Valid Situation | Visualizations with checkboxes are displayed |

| | |
|---|---|
| | while those with unchecked boxes are hidden. |
| Boundary Condition | No visualizations selected or all visualizations selected. |

| Use Case | Display tool details |
|---|---|
| Valid Tooltip Display Situation | User selects a single crime on the map and the tooltip for that crime is displayed. |
| Purpose | To allow users to view details about a specific crime. |
| Expected Results for Valid Situation | A tooltip is displayed over the selected crime point featuring information specific to that crime. |
| Boundary Condition | Clicking a cluster of data points merely zooms in on the map rather than open a tooltip. |

| Use Case | Display/input new comment |
|---|---|
| Valid Situation | Authenticated user selects a crime on the Map and chooses add or view comments. |
| Invalid Situation | Unauthenticated user tries to add or view comments on the application. |
| Purpose | To allow users to make notes about a particularly crime that could be useful for themselves or others. |
| Expected results for valid situation | User is able to write comments that are saved in the database and can review comments later. |
| Expected results for invalid situation | User redirected to Corporate sign in page. |
| Boundary Conditions | Blank comments are not saved to the database. |

| Use Case | Display comments on a crime |
|---|---|
| Valid Situation | Authenticated user selects view comments and is able to see all comments of a crime at the bottom of the page. |
| Invalid Situation | Unauthenticated user tries to view crime comments on the application. |
| Purpose | To allow users to see all the comments of a particular or related crimes. |
| Expected results for valid situation | Display the comment information for the crime on the bottom of the page in less than 3 seconds. |
| Expected results for invalid situation | User is redirected to Corporate sign in page. |
| Boundary Conditions | Selected crime does not have comments at which an alert is shown |


| Use Case | Zoom in and out on a map view |
|---|---|
| Valid Map Zoom in/out Situation | After the map loads, user is able to zoom in and out using double click on a place on a map; scroll on the control panel; or click the plus or minus button on the map. |
| Invalid Map Zoom in/out Situation | User's mouse is on the web page rather than map. |
| purpose | To test if the map is easy to zoom in and out. |
| Expected Results for Valid Situation | The map will zoom in based on user's choice, and the data clusters will split apart into smaller ones based on how much user zooms in. |
| Expected Result for Invalid Situation | When they scroll, the page will scroll down rather then zoom in/out on the page. |
| Boundary condition | When the map hits the maximum zoom in/out condition, it won't zoom in/out anymore. |

| Use Case | Filter the data based on crime type |
|---|---|
| Valid Crime Type Selection | The crime type filter is made up of a check box option for each description of the crime. There is no invalid way to possibly select these check boxes, anywhere from none to all of the boxes may be checked at any time. |
| Check results when all boxes are checked. | These tests are run filtering only by crime type, so the result is independent from the other filters. We initially test with 1000 crimes in our database for simplicity. When all boxes are checked, we correctly receive 1000 filter results since all of the crimes are included by the given filter selections. |
| Check results when none of the boxes are checked. | When none of the boxes are checked, we correctly receive 0 filter results since the user desires to see crimes that do not fit any of the crime types up for selection (none). |
| Check the results when 1 crime type is checked and the others are not. | When a single crime type is selected, only the crimes of that type are displayed. This can be proven by looking at the map. Select only the crime type "shooting" to ensure only the four shooting crimes of the 1000 are shown. |
| Check results when 2 crime types are checked. | When two crime types are selected, only the crimes of these types are displayed. This can be proven by looking at the map. Select only the crime type "shooting" and "robbery - residence" to ensure only the four shooting crimes added with the nine robbery - residence crimes show for a total of thirteen of the 1000. |
| Testing Cases Covered | Following these tests all cases should be covered, edge cases of none or all are covered and several in the middle are covered with the rest acting in the same as the middle cases. Also, seeing that when they are all clicked and everything returns ensures all variables are spelled correctly in the query. |

| Use Case | Filter the data based on the date/time the crime was committed |
|---|---|
| Valid Date / Time Selection | The date / time filter is made up of a drop down calendar. The drop down calendar prevents the user from entering an invalid start or end date. If an invalid time frame is given, it is auto corrected to a valid one and the user should see their attempted adjustment was not applied. |
| Check results when all dates are included. | These tests are run filtering only by date / time, so the result is independent from the other filters. We initially test with 1000 crimes in our database for simplicity. When the widest time range is selected, we correctly receive 1000 filter results since all of the crimes are included by the time range. |
| Check results when none of the boxes are checked. | When the time range has the start and end time equal, we correctly receive 0 filter results since there is no crime at that specific time. |
| Check the results for a time range of a month. | When a month date range is selected, only the crimes within that time frame are displayed. This can be proven by looking at the map. Select a time frame of a month and ensure that times within the frame are displayed while those outside are not. |
| Testing Cases Covered | Following these tests all cases should be covered, edge cases of none or all are covered. As well as a case with a limited time frame with the rest acting the same as this case. |

| Use Case | Filter the data based on the location (District) |
|---|---|
| Valid District Selection | The district filter is made up of a check box option for each district of Baltimore in the database. There is no invalid way to possibly select these check boxes, anywhere from none |

| | to all of the boxes may be checked at any time. |
|---|---|
| Check results when all boxes are checked. | These tests are run filtering only by district, so the result is independent from the other filters.  We initially test with 1000 crimes in our database for simplicity.  When all boxes are checked, we correctly receive 1000 filter results since all of the crimes are included by the given filter selections. |
| Check results when none of the boxes are checked. | When none of the boxes are checked, we correctly receive zero filter results since the user desires to see crimes that do not fit any of the districts up for selection (none). |
| Check the results when 1 district is checked and the others are not. | When a single district is selected, only the crimes within that district are displayed.  This can be proven by looking at the map.  Select only the district "northern" to ensure only the 125 northern crimes of the 1000 are shown (also see the map to prove they are in northern Baltimore). |
| Check results when 2 districts are checked. | When two districts are selected, only the crimes within these districts are displayed.  This can be proven by looking at the map.  Select only the districts "northern" and "southern" to ensure only the 125 northern crimes added with the 90 southern crimes show for a total of 215 of the 1000.  Also see the markers added to the map in the northern and southern locations. |
| Testing Cases Covered | Following these tests all cases should be covered, edge cases of none or all are covered and several in the middle are covered with the rest acting in the same as the middle cases.  Also, seeing that when they are all clicked and everything returns ensures all variables are spelled correctly in the query. |

| Use Case | Filter the data based on Weapons |
|---|---|

| Valid Weapon Type Selection | The weapon type filter is made up of a check box option for each weapon type within the database. There is no invalid way to possibly select these check boxes, anywhere from none to all of the boxes may be checked at any time. |
|---|---|
| Check results when all boxes are checked. | These tests are run filtering only by weapon type, so the result is independent from the other filters. We initially test with 1000 crimes in our database for simplicity. When all boxes are checked, we correctly receive 1000 filter results since all of the crimes are included by the given filter selections. |
| Check results when none of the boxes are checked. | When none of the boxes are checked, we correctly receive zero filter results since the user desires to see crimes that do not fit any of the weapon types up for selection (none). |
| Check the results when 1 weapon type is checked and the others are not. | When a single weapon type is selected, only the crimes of that type are displayed. This can be proven by looking at the map. Select only the crime type "Firearm" to ensure only the 66 firearm crimes of the 1000 are shown. |
| Check results when 2 weapon types are checked. | When two weapon types are selected, only the crimes of these types are displayed. This can be proven by looking at the map. Select only the crime type "Firearm" and "hands" to ensure only the 66 firearm crimes added with the 179 hands crimes show for a total of 245 of the 1000. |
| Testing Cases Covered | Following these tests all cases should be covered, edge cases of none or all are covered and several in the middle are covered with the rest acting in the same as the middle cases. Also, seeing that when they are all clicked and everything returns ensures all variables are spelled correctly in the query. |

| Use Case | Filter Data Based on Premise |
|---|---|

| | |
|---|---|
| Valid Premise Selection | The premise filter is made up of a check box option for each premise within the database. There is no invalid way to possibly select these check boxes, anywhere from none to all of the boxes may be checked at any time. |
| Check results when all boxes are checked. | These tests are run filtering only by premise, so the result is independent from the other filters. We initially test with 1000 crimes in our database for simplicity. When all boxes are checked, we correctly receive 1000 filter results since all of the crimes are included by the given filter selections. |
| Check results when none of the boxes are checked. | When none of the boxes are checked, we correctly receive zero filter results since the user desires to see crimes that do not fit any of the premises up for selection (none). |
| Check the results when 1 premise is checked and the others are not. | When a single premise is selected, only the crimes of that type are displayed. This can be proven by looking at the map. Select only the premise "Alley" to ensure only the eight alley crimes of the 1000 are shown. |
| Check results when 2 premises are checked. | When two premises are selected, only the crimes of these types are displayed. This can be proven by looking at the map. Select only the premises "Alley" and "Apartment" to ensure only the eight alley crimes added with the 41 apartment crimes show for a total of 49 of the 1000. |
| Testing Cases Covered | Following these tests all cases should be covered, edge cases of none or all are covered and several in the middle are covered with the rest acting in the same as the middle cases. Also, seeing that when they are all clicked and everything returns ensures all variables are spelled correctly in the query. |

| Use Case | Toggle Cluster Map Markers |
|---|---|

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| Valid Situation | User toggles whether they want the data on the map clustered or not. |
| --- | --- |
| Purpose | To let the user better handle data on the map. |
| Expected Results for Valid Situation | If checked the data is clustered by proximity and the clusters contents are numbered. If unchecked the data will split into individual color coded points on the map. |

3.2 Test Results

### 3.2.1  Load the web application

Tester: Angel Cheng
Valid Load web application Result:

*Webpage displays all the visualizations with all the filters on.*

*Open the web page with a smaller web window (the sidebar will disappear)*


*A filter selection button will show up*

*Open the web page using smaller web window with the sidebar showing.*

### 3.2.2  Clear All/Select All

Tester: Katelyn Seitz
Valid select/clear results:

*Clicking "Select All" selects all data.*

*Clicking "Clear All" clears all data.*

### 3.2.3 Visualization type selection

Tester: Katelyn Seitz
Valid visualization type selection result:

*All selected visualizations (heatMap and table) are displayed on the webpage.*

### 3.2.4 Display tooltip details

Tester: Katelyn Seitz
Valid tooltip display results:

*Each individual data point displays its own tooltip upon selection.*

### 3.2.5 Enter/Display a comment for a Crime
### 3.2.6 Display all comments for a Crime

Tester: Sam Mendimasa
All results below are as expected.

Test 3.2.5 and 3.2.6 is combined. Enter a blank comment that display in the image below has no affect. Entering a valid comment is display in the comments section along with the user that added the comment. See images below.

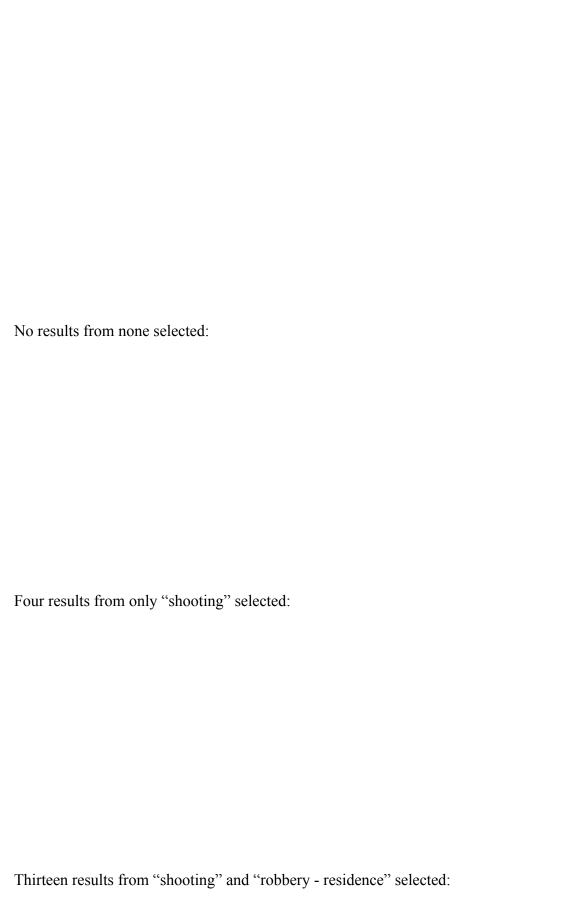### 3.2.7  Zoom in and out on a map view

Tester: Angel Cheng
Valid Map Zoom in and out Result:

*Map view for default zoom condition.*

*Button to make the map full page shows in the top right.*

*Map view for full screen.*

*Map view after zooming in one layer.*

*Map view after zooming in a couple times.*

### 3.2.8  Filter the data based on crime type

Tester: Zach Vance

We did have to fix our logic for the SQL queries several times.  The and / or logic we first used was an incorrect way to go about combining the queries for the filters and we found a nested query to work best.

All results below are as expected.

1000 results from all selected:

No results from none selected:

Four results from only "shooting" selected:

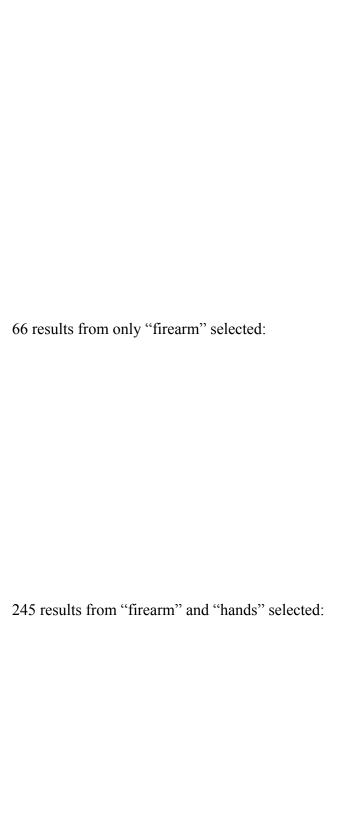Thirteen results from "shooting" and "robbery - residence" selected:

### 3.2.9 Filter the data based on the date/time the crime was committed

Tester: Zach Vance
All results below are as expected.

1000 results widest date / time range:

No results from single date / time:

34 results from time range of a month:

### 3.2.10 Filter the data based on the location (District)

Tester: Zach Vance
All results below are as expected.

1000 results from all selected:

No results from none selected:

125 results from only "northern" selected:

215 results from "northern" and "southern" selected:

### 3.2.11 Filter the data based on Weapons

Tester: Zach Vance
All results below are as expected.

1000 results from all selected:

No results from none selected:

66 results from only "firearm" selected:

245 results from "firearm" and "hands" selected:

**3.2.12 Filter Data by Premise**

Tester: Katelyn Seitz
All results below are as expected.

*1000 results from all selected.*

*No results from none selected.*

*Eight results from "Alley" selected.*

*49 results from "Alley" and "Apartment" selected.*

### 3.2.13. Cluster Map Markers

Tester: Katelyn Seitz
Valid cluster results:

*Cluster toggled off.*

*Cluster toggled on.*

**Appendix A – Team Review Sign-off**

This document has been collaboratively written by all members the team. Additionally, all team members have reviewed this document and agree on both the content and the format. Any disagreements or concerns are addressed in team comments below.

**Team:**

Name:                                                                Date:

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Signature

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Comments

Name:                                                                Date:

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Signature

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Comments

Name:                                                                Date:

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Comments

Name:                                                                Date:

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Comments

**Appendix B – Document Contributions**

Throughout the development of this document, each team member contributed in some way, hence the overall work distribution split evenly across all members (Angel 25%, Sam 25%, Katelyn 25%, and Zach 25%). The specific breakdown of work contribution is also divided across all sections, as we all worked on this document together.