Software Testing Document

System: Parking Lot Availability Tracker

Software Engineering

CSCI 5330A

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**System Level Requirements Validation Checklist**

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| **Description** | **✔/✘** | **Comments** |
| Has overall feasibility been addressed? | **✔** |  |
| Have all stakeholders been identified and polled for agreement? | **✔** |  |
| Have the overall function and behavior of the system been defined? | **✔** |  |
| Based on existing documentation/information, do you understand the system in the context of each of the views in the system engineering hierarchy? | **✔** |  |
| Have system processes been adequately (unambiguously) and consistently defined? | **✔** |  |
| Is system output and input adequately defined? | **✔** |  |
| Have system-level assumptions, simplifications, limitations, constraints and preferences been explicitly and unambiguously stated? | **✔** |  |
| Has simulation been done to demonstrate technological feasibility? | **✘** | Have not tested algorithm with an actual car |
| Has a data architecture been identified? | **✔** |  |
| Has an application (functional) architecture been defined? | **✔** |  |
| Has the required technology infrastructure for the system been adequately defined? | **✔** |  |
| Has requirements elicitation been performed at the system level? | **✘** | All requirements have not been fulfilled |
| Has business and technical feasibility been assessed? | **✔** |  |
| Have usage scenarios been created at the system level? | **✔** |  |
| Has a requirements management process been established for the system? | **✔** |  |
| Has allocation occurred for all system elements? | **✔** |  |
| Is the allocation for software reasonable and well-defined? | **✔** |  |
| Has a system model (e.g., a Hatley-Pirbhai model) been developed? | **✔** |  |

**Software Requirements Specification Checklist**

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| **Description** | **✔/✘** | **Comments** |
| Do stated goals and objectives for software remain consistent with system goals and objectives? | ✔ |  |
| Have important interfaces to all system elements been described? | ✔ |  |
| Have all data objects been described? Have all attributes been identified? | ✔ |  |
| Do major functions remain within scope and has each been adequately described? | ✔ |  |
| Have functions been refined (elaborated) to an appropriate level of detail? | ✔ |  |
| Is information flow adequately defined for the problem domain? | ✔ |  |
| Are diagrams clear; can each stand alone without supplementary text? | ✔ |  |
| Is the behavior of the software consistent with the information it must process and the functions it must perform? | ✔ |  |
| Have events and states been identified? | ✔ |  |
| Are design constraints realistic? | ✔ |  |
| Have technological risks been fully defined? | ✔ |  |
| Have alternative software requirements been considered? | ✔ |  |
| Have validation criteria been stated in detail; are they adequate to describe a successful system? | ✔ |  |
| Have inconsistencies, omissions or redundancy been identified and corrected? | \* | \*Clock requires upgrade to better, more consistent model, Time sync |
| Is the customer contact complete? | ✔ |  |

**Design Model Checklist**

**General Issues**

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| **Description** | **✔/✘** | **Comments** |
| Does the overall design implement all explicit requirements? Has a traceability table been developed? | ✔ |  |
| Does the overall design achieve all implicit requirements? | \* | \*System requires more accurate clock, coupled with time updates from gateway to meet all requirements |
| Is the design represented in a form that is easily understood by outsiders? | ✔ |  |
| Is design notation standardized? Consistent? | ✔ |  |
| Does the overall design provide sufficient information for test case design? | ✔ |  |
| Is the design created using recognizable architectural and procedural patterns? | ✔ |  |
| Does the design strive to incorporate reusable components? | ✔ |  |
| Is the design modular? | ✔ |  |
| Has the design defined both procedural and data abstractions that can be reused? | ✔ |  |
| Has the design been defined and represented in a stepwise fashion? | ✔ |  |
| Has the resultant software architecture been partitioned for ease of implementation? Maintenance? | ✔ |  |
| Has a Design Specification been developed for the software? | ✔ |  |

**Data Design**

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| **Description** | **✔/✘** | **Comments** |
| Have data objects defined in the analysis model been properly translated into required data structures? | ✔ |  |
| Do the data structures contain all attributes defined in the analysis model? | ✔ |  |
| Have any new data structures and/or attributes been defined at design time? | ✔\* | \*RDS instance required occasional updating to meet requirements |
| How do any new data structures and/or attributes relate to the analysis model and to overall user requirements? | ✔ |  |
| Have the simplest data structures required to do the job been chosen? | ✔ |  |
| Can the data structures be implemented directly in the programming language of choice? | ✔ |  |
| How are data communicated between software components? |  | Gateway pipes from node to RDS using Node.js |
| Do explicit data components (e.g., a database) exist? If so, what is their role? | ✔ | Houses collected data and allows for retrieval by the end user on the website |

**Architectural Design**

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| **Description** | **✔/✘** | **Comments** |
| Has a library of architectural styles been considered prior to the definition of the resultant software architecture? | ✔ |  |
| Has architectural tradeoff analysis been performed? | ✔ | This architecture is required when creating an application that uses LoRa and an end user application. |
| Is the resultant software architecture a recognizable architectural style? | ✔ | Three-tier system |
| Has the architecture been exercised against existing usage scenarios? | ✔ |  |

**User Interface Design**

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| **Description** | **✔/✘** | **Comments** |
| Have the results of task analysis been documented? | ✔ |  |
| Have goals for each user task been identified? | ✔ |  |
| Has an action sequence been defined for each user task? | ✔ |  |
| Have various states of the interface been documented? | ✔ |  |
| Have objects and actions that appear within the context of the interface been defined? | ✔ |  |
| Have the three "golden rules" (SEPA, 5/e, p. 402) been maintained throughout the GUI design? | ✔ |  |
| Has flexible interaction been defined as a design criterion throughout the interface? | ✔ |  |
| Have expert and novice modes of interaction been defined? | **✘** |  |
| Have technical internals been hidden from the casual user? | ✔ |  |
| Is the on-screen metaphor (if any) consistent with the overall applications? | ✔ |  |
| Are icons clear and understandable? | ✔ |  |
| Is interaction intuitive? | ✔ |  |
| Is system response time consistent across all tasks? | ✔ |  |
| Has an integrated help facility been implemented? | **✘** |  |
| Are all error message displayed by the interface easy to understand? Do they help the user resolve the problem quickly? | ✔ |  |
| Is color being used effectively? | ✔ |  |
| Has a prototype for the interface been developed? | ✔ |  |
| Have user's impressions of the prototype been collected in an organized manner? | **✘** |  |

**Component-Level Design**

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| **Description** | **✔/✘** | **Comments** |
| Has each algorithm been "desk-tested" to uncover errors? Is each algorithm correct? | ✔ |  |
| Is the design of the algorithm consistent with the data structured that the component manipulates? | ✔ |  |
| Have algorithmic design alternatives been considered? If yes, why was this design chosen? | ✔ | The final algorithm to detect a vehicle was selected as it was the most basic way of identifying a vehicle. More complex analyses can be built on top of this algorithm in the future. |
| Has the complexity of each algorithm been computed? | ✔\* | \*Complexity of all implemented algorithms well within acceptable levels |
| Have structured programming constructs been used throughout? | ✔ |  |

**Test Cases**

**Embedded Systems Testing**

Software Tests

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| Test Case | E-CarDetection-0 |
| Test Preconditions | Gateway has successfully received packets from both nodes |
| Description | Send traffic events in data packet that will satisfy the carDetection algorithm |
| Purpose | To monitor the amount of cars passed |
| Methods | Have each node to send packets to the gateway containing traffic event times that signify that an object set off both of them at the same time. |
| Result | Pass |

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| Test Case | E-CarDetection-1 |
| Test Preconditions | Gateway has successfully received packets from both nodes |
| Description | Send traffic events in data packet that will satisfy the carDetection algorithm and send traffic events that will not satisfy the algorithm |
| Purpose | To ensure the accuracy of the opening spots data being updated in the database |
| Methods | Have each node to send packets to the gateway containing traffic events and compare the start and end times of the traffic events on both nodes and should the start and end time follow the conditions of the algorithm increment the car counter variable and update the row value in database. |
| Result | Pass |

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| Test Case | E-PacketTransmission-0 |
| Test Preconditions | Both nodes are able to send to gateway through single channel |
| Description | Send packets to gateway to test packet transmission reliability |
| Purpose | To mitigate packet loss |
| Methods | Create time slots for the nodes and have them send immediately after the previous node’s packet has transmitted. |
| Result | Pass |

**Mobile Application Testing**

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| Test Case | M-Lot-0 |
| Description | To ensure the proper handling of a query from the homepage of the mobile application. There will be a picker filled with the lot number and when selected, it should return the appropriate spaces available. |
| Prerequisites | The lot must be in the database with the proper pre-verified output. |
| Input | Manual Selection of “Lot 42” in the picker |
| Output | Lot 42 should be displayed with the appropriate amount of open spots available that is in the database |
| Pass/Fail | Fail (Currently working towards) |

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| Test Case | M-Location-0 |
| Description | To ensure the proper handling of getting permission for location services while using the app. This happens when you first install the application and navigate to the map tab. |
| Prerequisites | This must be a fresh install because it only asks this question on first launch. |
| Input | Open app and navigate to the map tab. |
| Output | Pop up message requesting location appears. |
| Pass/Fail | Pass |

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| Test Case | M-Location-1 |
| Description | To ensure that location services will be turned off after initially allowing it. |
| Prerequisites | The user must have selected to allow location services to track them on the app’s first launch. |
| Input | Navigate to the settings page and turn the location switch off. |
| Output | Navigate back to the map page. It is no longer tracking your location |
| Pass/Fail | Pass |

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| Test Case | M-Location-2 |
| Description | To ensure that location services can be turned back on after turning off |
| Prerequisites | You would have to have had location services turned on, then turned off in the settings page. |
| Input | Navigate to the settings page, turn the location switch back on |
| Output | Navigate back to the map tab and you will see it is tracking your location again. |
| Pass/Fail | Pass |

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| Test Case | M-Location-3 |
| Description | To ensure that you cannot turn location services back on in the app if you initially did not allow it to track you in the initial install. You will need to go to your phone’s settings. |
| Prerequisites | You will need to have not allowed location services when prompted on the first install. |
| Input | Navigate to settings menu and notice that the location switch if off. Try to turn it on. |
| Output | Pop up message letting you know location services is disabled. (Two options: Cancel and Open Settings) |
| Pass/Fail | Pass |

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| Test Case | M-Location-4 |
| Description | To ensure that the location switch pop up successfully takes you into your app location settings. |
| Prerequisites | You will need to have not allowed location services when prompted on the first install. Open settings and try to turn on location services. |
| Input | Select “Open Settings” from the pop up. |
| Output | App redirects to phone’s settings menu for location services. |
| Pass/Fail | Pass |

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| Test Case | M-Map-0 |
| Description | To ensure that the map loads correctly with lot pins and zoomed in correctly. |
| Prerequisites | No prerequisites |
| Input | Open the app and navigate to the map tab. |
| Output | Map is automatically zoomed in on Georgia Southern, your location is/is not showing (depending on location services preferences) and all pins are showing parking lots. |
| Pass/Fail | Partial fail (Not all pins are showing - currently working towards) |

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| Test Case | M-Map-1 |
| Description | To ensure that the correct number of open spots are shown when clicking on a map pin |
| Prerequisites | Open app and navigate to the map tab |
| Input | Click on lot 42 pin |
| Output | Action sheet pops up showing the correct number of available spots and two selectable options (Cancel and Directions) |
| Pass/Fail | Fail (Working towards) |

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| Test Case | M-Map-2 |
| Description | To ensure that the Directions button opens up navigation to the parking lot |
| Prerequisites | Navigate to the map tab and click on lot 42 pin |
| Input | Click on the directions button on the action sheet |
| Output | Successfully opens Apple Maps with driving directions from your current location |
| Pass/Fail | Pass |

**Website Testing**

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| Test Case | M-Lot-0 |
| Description | To ensure that the selected lot name, capacity, and available spots displays correctly. |
| Prerequisites | Click on selector to display list of lots |
| Input | Select desired lot from the selector |
| Output | Successfully displays specific lot information |
| Pass/Fail | Pass |

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| Test Case | M-Map-0 |
| Description | To ensure that the map is centered on the desired lot when chosen |
| Prerequisites | Lot must be chosen |
| Input | Select a lot from lot selector |
| Output | Successfully zooms and centers the selected lot location |
| Pass/Fail | Pass |

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| Test Case | M-Login-0 |
| Description | To ensure that the admins can login successfully to the admin panel |
| Prerequisites | Must be on admin login screen |
| Input | Input credentials |
| Output | Successfully opens admin panel |
| Pass/Fail | Pass |

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| Test Case | M-Logout-0 |
| Description | To ensure that the admins will be able to log out of the admin panel |
| Prerequisites | Must be logged into the admin panel |
| Input | Click logout button at top left corner |
| Output | Successfully logs out of admin panel |
| Pass/Fail | Pass |

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| Test Case | M-Lot-0 |
| Description | To ensure that the admins will be able to edit any existing lot |
| Prerequisites | Click “edit lot” table to navigate to the edit lot page |
| Input | Select desired lot and input capacity and available spots |
| Output | Successfully updates database |
| Pass/Fail | Pass |

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| Test Case | M-Lot-1 |
| Description | To ensure that the admins will be able to create new lotsl |
| Prerequisites | Click “create lot” at the top of the screen |
| Input | Choose campus and input new lot information |
| Output | Successfully updates the database to include the new lot |
| Pass/Fail | Pass |

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| Test Case | M-User-0 |
| Description | To ensure that the admin will be able to change their password via admin panel |
| Prerequisites | Must be logged in and on the “user options” page |
| Input | Input credentials and new credentials |
| Output | Successfully updates password in the database |
| Pass/Fail | Pass |

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| Test Case | M-Admin-0 |
| Description | To ensure that the admins will be able to add new admin authorizations |
| Prerequisites | Must be logged and on the “user options” page |
| Input | Input credentials and new admin information |
| Output | error |
| Pass/Fail | Failed |