Project Delivery Methodology (PDM)

System Requirements

[DAKA, Chicago HQ]

PROJECT PARKA

VERSION: [1.1] REVISION DATE: [2/17/2022]

Approval of the System Requirements indicates an understanding of the purpose and content described in this deliverable. By signing this deliverable, each individual agrees with the content contained in this deliverable.

Approver Name	Title	Signature	Date

Contents

Section 1 Purpose

The purpose of the System Requirements document is to specify the overall system requirements that will govern the development and implementation of the system. The document will also establish initial security, training, capacity and system architecture requirements, as well as, system acceptance criteria agreed upon be the project sponsor and key stakeholders.

1.1 Product Description

Project Parka is a software product that is designed to detect empty parking spots. The project is implemented on the Saint Xavier University campus to alleviate the struggles SXU students, faculty, and staff face to find a parking spot. This project will include 2 interfaces, an App that will display a graphical map of SXU's campus, which will allow users to easily view all available parking spots for each parking lot on campus. This product will also include a physical model of SXU's lot 12 parking lot that will demonstrate how the product works.

Section 2 General System Requirements

2.1 Major System Capabilities

Specify the major system capabilities in terms of availability, target deployment environment(s), device accessibility, and/or technical capability.

SYSTEM AVAILABILITY

FR1 - System must be available on the Internet
FR2 - System must be available from 6AM CST to 10PM CST
FR3 - System must be accessible by mobile devices (Android)
FR4 - System must have a User Interface
FR5 - System must provide close to accurate readings

MAIN SCREEN

FR6 - System must require users to login using SXU's netid system
FR7 - System must require user to read and agree to terms and conditions before gaining access to application
FR8 - System must provide home screen/page with SXU's map split into four sections (Northwest, Northeast, Southeast, Southwest) and allow user to tap specific region
FR9 - System must zoom into section tapped on map and provide lot numbers on map

PARKING AVAILABILITY SUB-SYSTEM

FR10 - System must replicate actual camera feed into a simple graphic design using simple shapes that are proportionally accurate to the real-life map
FR11 - System must use camera feed to determine if a parking spot is occupied using number of pixels
FR12 - System must allow users to tap a lot to see which spots are taken and which are open (must specify exactly which spots are taken with a red 'X' and which are open with a green filled rectangle.)
FR13 - System must calculate an integer number of spots available using car detecting camera and display this number just above the mini-map of the lot
FR14 - System must allow user to return to previous screens
FR15 - System must allow users to "star/favorite" specific parking spots
FR16- System must place an orange star on the parking lots users have marked as their favorite in all versions of the map (full map and section map).
FR17 - System must only allow students to see parking availability for students
FR18 - System must only allow faculty to see parking availability for faculty
FR19 - System must only allow staff to see parking availability for staff
FR20 - System must ONLY ALLOW SXU president and ministry staff to view lot availability in Lot 11
FR21 - System must inform users that Lot 11 unavailable to students, faculty, and staff
FR22 - System must NOT show students, faculty, and staff parking availability for Lot 11

SETTINGS/PREFERENCES SUB-SYSTEM

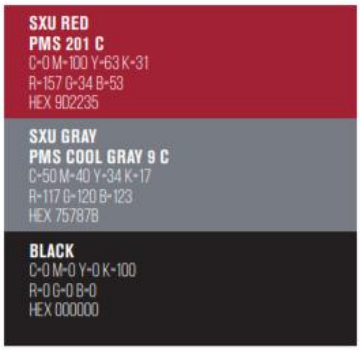
FR23 - System must include a toggle on/off option for dark mode under settings
FR24 - System must turn white background to a dark gray when dark mode is enabled
FR26 - System must allow user to choose between being left or right-handed in the settings tab
FR27 - System must originally be set in the right-handed design BY DEFAULT
FR28 - System must shift done and back buttons to the bottom left if user toggles the left-handed option under settings
FR29 - System must save user preferences

SUB-SYSTEM FOR WEBMASTER

FR30 - System must require login
FR31 - System must allow webmaster to view live camera feed remotely using a desktop computer
FR32 - System must allow webmaster to reset and recalibrate cameras using a simple button and two confirmation screens (one after the other)

2.2 Non-Functional Requirements

NFR1 – Screen must be displayed with contrasting colors. Only the following colors may be used:



NFR2 – Lettering must be a minimum of 18pt (points).

NFR3 – Sub menus must respond withing .25 seconds.

NFR4 - System must show users their name, ID number, and email, in the profile screen/page

NFR5 - Webmaster must pass two confirmation screens in order to reset or recalibrate cameras.

NFR6 - System must ask webmaster for input reasoning for viewing live camera feed, date, and signature using a form

2.3 Major System Conditions

Assumptions:

- *Must include entire SXU campus map*
- *System must use display device(s)*
- *System must use web server to transfer data*

Constraints:

- *Must use Python IDE*
- *Must use Raspberry Pi*
- *Must use external camera(s) compatible with Raspberry Pi*

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2.4 System Interfaces

This system has **two** external interfaces.

The android app depends on data relayed by Raspberry Pi through the Internet. Using the connected camera, the Raspberry Pi with conduct all computations. This information is sent to the application and is shown on a mini map to the user. Number of spaces available will also be displayed on a digital monitor beside each parking lot.

The desktop app is designed for the webmaster only. It allows access to cameras and resetting/recalibrating cameras.

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2.5 System User Characteristics

Identify each type of user of the system by function, location, and type of device. Specify the number of users in each group and the nature of their use of the system.

- ***GROUP 1 (STUDENTS)** – Students can use the software on a mobile phone to quickly see how many parking sports are available in each parking lot that surrounds the campus from anywhere. (Estimated number of users: 4,000)*
- ***GROUP 2 (FACULTY)** – Professors can use the software on a mobile phone to quickly see how many parking sports are available in each parking lot that surrounds the campus from anywhere. (Estimated number of users: 100)*
- ***GROUP 3 (STAFF)** – Staff members can use the software on a mobile phone to quickly see how many parking sports are available in each parking lot that surrounds the campus from anywhere. (Estimated number of users: 300)*
- ***GROUP 4 (WEBMASTER)** – Webmaster(s) can use the software on a desktop computer to quickly view camera feed, reset cameras, and calibrate cameras. (Estimated number of users: 1-3)*
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Section 3 Policy and Regulation Requirements

Specify relevant applicable laws, regulations, policies, and standards that will affect the operation and performance of the system, as well as any relevant external regulatory requirements, or constraints imposed by normal business practices.

3.1 Policy Requirements

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- Only certified webmasters will have access to the program data and security footage.
- Student parking passes may require signature for waiver acknowledging that license plates may be scanned by the system (Students and staff would have to sign the waiver at the start of each semester).

3.2 Regulation Requirements

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- Audio not permitted on camera to abide by state law.
- Footage cannot be released to anybody except law enforcement with probable cause for concern.

Section 4 Security Requirements

Specify security requirement for users of the system.

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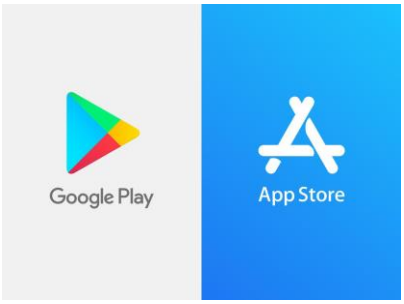
- The application can only be accessed by students, faculty, and staff.
- Application will be protected and require login with SXU NETID and password.

Section 5 Training Requirements

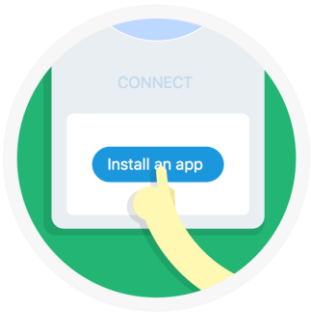
Specify Training requirements for the system.

- Knowledge of how to use a mobile phone.
    - Quick tutorial on how to download and use the Project PARKA app.

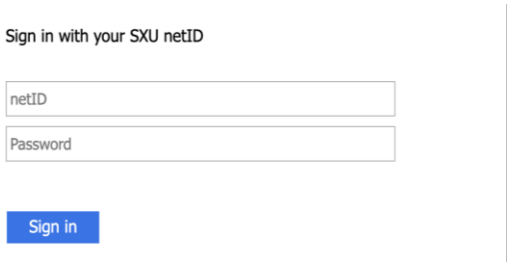
Step 1: Search for "PARKA" in the App Store or Google Play Store



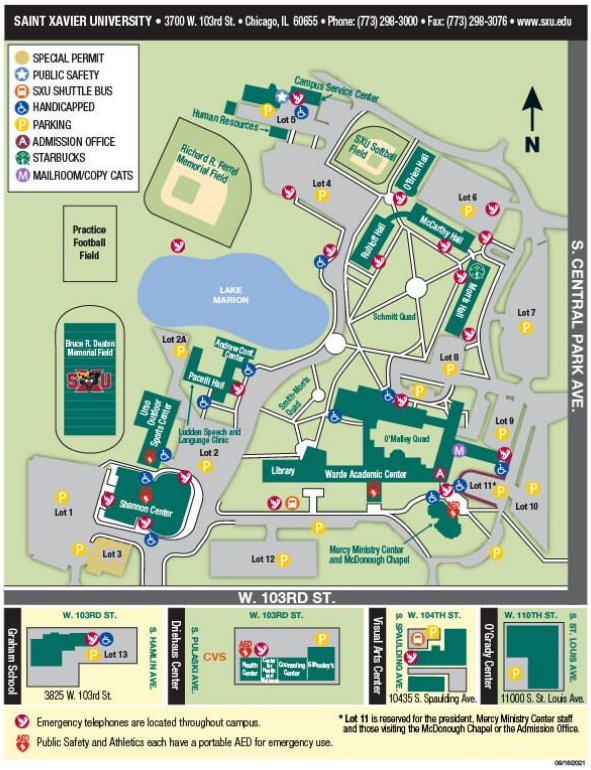
Step 2: Install the app on mobile phone



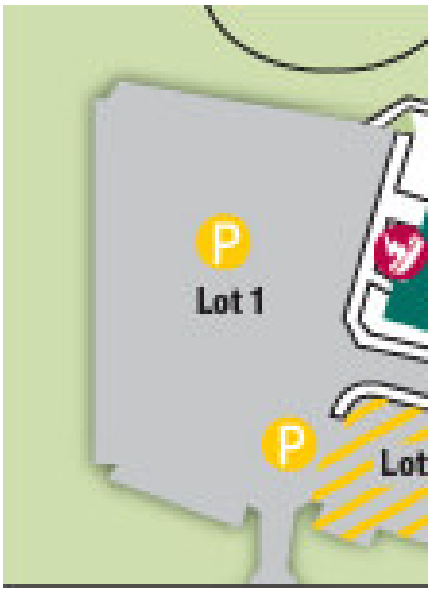
Step 3: Log in with SXU credentials



Step 4: Click on the campus map



Step 5: Click on desired lot to find parking



Section 6 Initial Capacity Requirements

Specify the initial capacity requirements for the system. An initial estimation can be established using current data amounts, planned number of users, and estimated number of transactions.

a. *Identifies the highest and lowest estimated number of transactions and processing frequency expected usage (including any seasonal peaks) for capacity planning for storage and memory requirements for the application or project. Identifies the highest and lowest estimated number of transactions and processing frequency expected usage (including any seasonal peaks) for capacity planning for storage and memory requirements for the application or project.*

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- The highest number of transactions will be all students and staff using the app would be during August – start of December and January-start of May (since these are the times when most students are on campus).
- The lowest number of transactions would be when most students are on break (May-August and December).
- Seasonal peaks could be at the start of each semester (August/January)
- Seasonal dips can be during summer and winter breaks or holidays.

Section 7 Initial System Architecture

Specify the data platform, hardware, software, programming languages, tools and operating system requirements for the application or project.

a. *Identify any specialized hardware requirements that must be purchased or upgraded prior to development, or in support of the implementation, of the application or project.*
b. *Identify any specialized software requirements that must be purchased or upgraded prior to development, or in support of the implementation, of the application or project.*
c. *Identify any programming languages and tools selected for the development of the application or project.*
d. *Identify any network/operating system or combination of network/operating systems that will be used for the development of the application of project.*

Initial System Architecture Description:

The raspberry pi will be used on the physical model to test and demonstrate how the product works. The LCD display will be connected to the raspberry pi and installed on the physical model to display output (number of available spots). A breadboard will be used with the raspberry pi to provide more GPIO pins. WinSCP and Putty will be used to access the raspberry pi from a laptop (remote connect).

b. Hardware:

- Raspberry pi
- Camera that's compatible with Raspberry Pi
- LCD display for displaying output on the physical model
- MicroSD card with OS
- Breadboard
- Lights for physical model
- 2X2 wood base (For physical model)
- Toy cars
- Paint
- Fake grass

c. Software:

- Revit or blender to create physical model of one parking lot at Saint Xavier University
- GitHub for sharing code and other documentation
- Visual studio code
- Raspberry pi python IDLE
- WinSCP for remote connection
- Putty to access Raspberry pi terminal

d. programming languages:

- Python will be used for backend development
- Opencv, cvzone, numpy,
- For frontend development HTML, CSS, and JavaScript will be used.

f. Network/Operating system:

- Raspbian OS

- Windows

Section 8 System Acceptance Criteria

Specify the general system acceptance criteria specified and agreed upon by the project sponsor and key stakeholders that will be used to accept the final end product. For example:

- *New system must run in parallel with current production system for x months*
- *3 years of data must be in system (conversion implied) on day one*

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- System must be able to analyze and test data coming from a live, Camera will be connected to the raspberry pi and installed on the physical model of the parking lot.
- System must display output (number of available spots in the parking lot) on an LCD screen.

Section 9 Current System Analysis

If a current system exists, perform analysis on the system and describe how the current system is used by the business. Specify data conversion requirements, relevant data flows, system interfaces to existing systems, reporting capability, etc.

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Current system does not exist.

Section 10 References

Provide a list of all documents and other sources of information referenced in this document and utilized in its development. Include for each the document number, title, date, and responsible office/author.

Document No.	Document Title	Date	Author

Section 11 Glossary

Define of all terms and acronyms required to properly interpret the requirements contained within this document.

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- *LCD Display: Liquid Crystal Display*
- *NETID: Unique username for students, staff, and faculty at Saint Xavier University*
- *Webmaster: person who maintains particular website/application*
- *SXU: Saint Xavier University*

Section 12 Document Revision History

Identify revisions to the document starting with initial creation. This section should be updated when an approval is required (i.e. initial creation, change request, new mandated change, etc)

Version	Date	Name	Description
1.0	1/27/2022	PROJECT PARKA	Initial Creation
1.1	2/17/2022	PROJECT PARKA	Change Request

Section 13 Appendices

Include any relevant appendices.

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