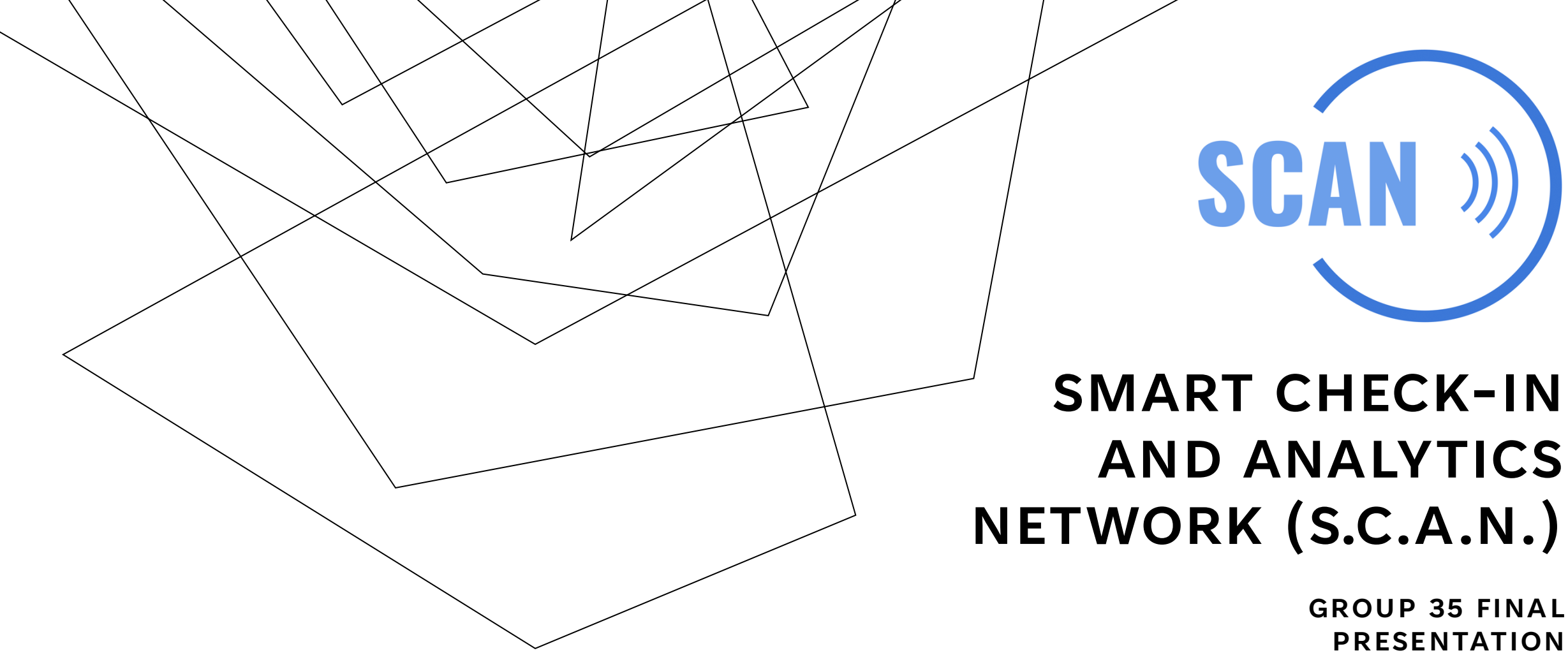


SMART CHECK-IN AND ANALYTICS NETWORK (S.C.A.N.)

GROUP 35 FINAL PRESENTATION

CORY BRYNDS
JONAH SPRANDEL
DEANDRE HENDRIX

TEAM INTRODUCTION

Jonah Sprandel
(Electrical Engineering)

PCB/Power System Design
Wireless Firmware Development

Cory Brynds
(Computer Engineering)

Frontend Embedded Software
Enclosure Design

DeAndre Hendrix
(Computer Engineering)

Backend Software Design
Web Application Development

Cory (CpE)

PROJECT MOTIVATION

- At a large public university like UCF, data collection is essential
- As an example, the UCF Recreation and Wellness Center uses check-in data for:
  - Facilities scheduling and staffing
  - Budgeting and financing
  - Determining attendee retention
- Existing check-in kiosks and software-as-a-service (SaaS) packages are expensive, non-portable, and overcomplicated

PROJECT BACKGROUND

- SCAN is a smart check-in kiosk and accompanying web interface
- SCAN provides real-time occupancy data, average stay duration, and usage trends.
- Mock UCFID cards facilitate authentication using near-field communication (NFC)
  - No real UCF IDs were used or modified for the making of this project

PROJECT GOALS

Cory (CpE)

BASIC GOALS

- SCAN will be used to identify, authenticate, and check in users
- SCAN will collect and track user data through a user database
- SCAN will analyze user data and provide actionable insights
- A web application will display and visualize SCAN's insights

ADVANCED GOALS

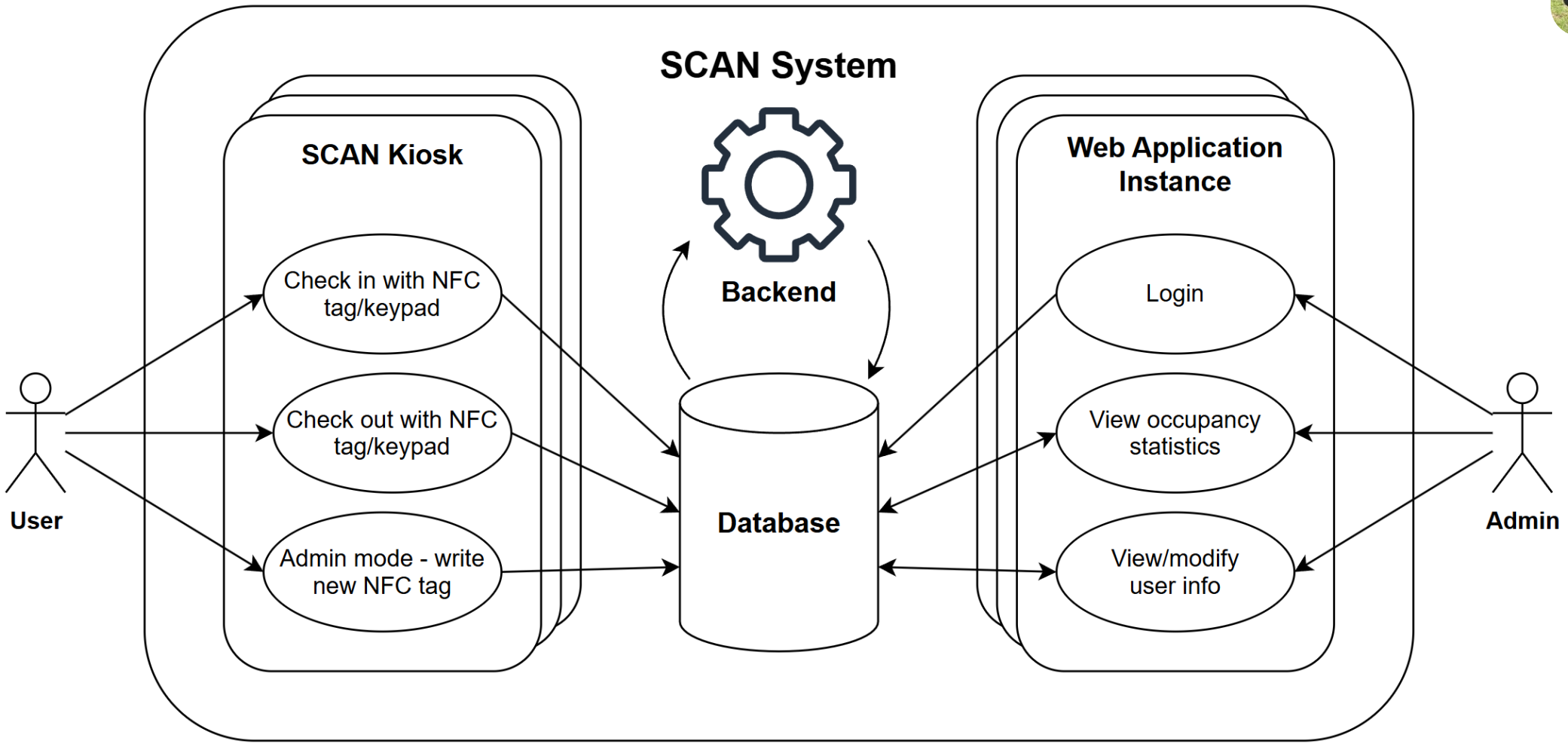
- SCAN can write new user ID cards through an administrator mode
- SCAN's firmware will efficiently execute features and tasks using FreeRTOS
- SCAN can provide check-in and analytics from multiple locations

STRETCH GOALS

- SCAN can receive over-the-air updates for firmware patches
- The SCAN web application will implement lazy loading for more efficient data fetching
- The SCAN system will be capable of being charged by solar power

DeAndre (CpE)

USE CASE DIAGRAM



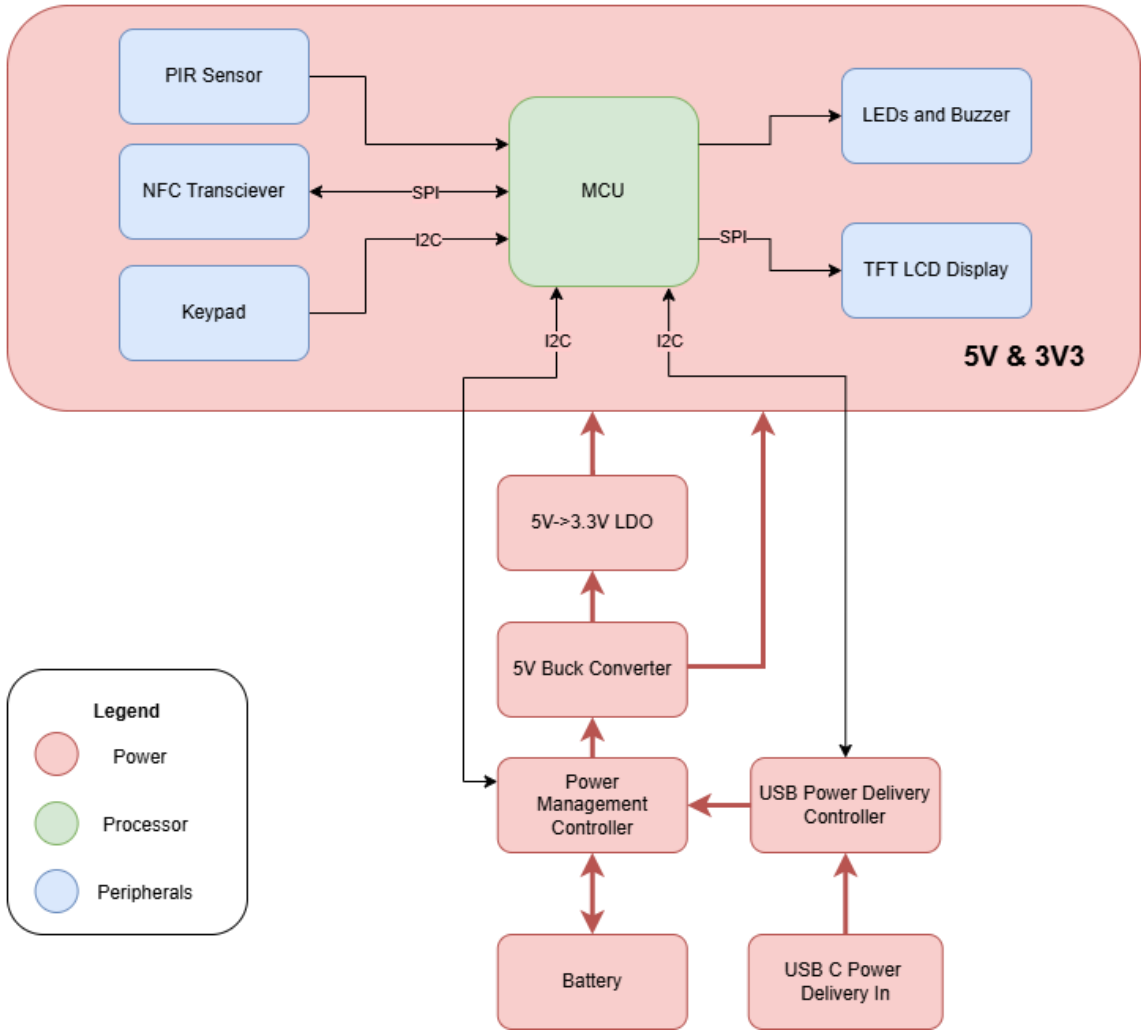
REQUIREMENT SPECIFICATIONS

DeAndre (CpE)

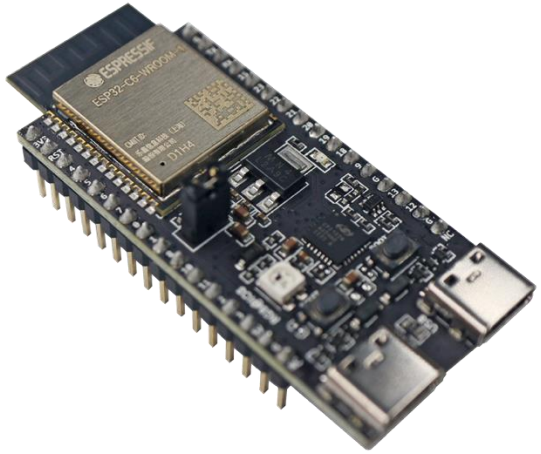
Feature	Requirement	Specification
Time to Authenticate	SCAN will **authenticate the credentials of a user ID in less than 10 seconds**.	< 10 seconds
Authentication Accuracy	SCAN will accurately authenticate users with an **error rate of 5% or less**.	> 95%
Analytics Refresh Rate	The analytics of SCAN's collected data will be updated within one minute of receiving new data	< 1 minute
Enclosure Size	The **maximum size of the enclosure and stand** for each SCAN system will be **1'x1'x4'**	< 1'x1'x4'
Authentication Methods	SCAN will support **two methods of authentication**: NFC tags and manual entry of a user ID through a keypad.	2
Battery Operating Time	The SCAN kiosk will have a **minimum operating time of 2 hours** on battery power under typical operating conditions.	> 2 hours
Charging Power	SCAN will have a **minimum supported charging power of 10W.**	> 10 W
Proximity Sensing Range	SCAN will be able to **detect users within a 1.5-meter range**.	> 1.5 meters
Number of Check-in Statistics	SCAN will display at least **three forms of analytics** based on check-in data, including occupancy, peak hours throughout the week, and the average duration of a user's stay.	> 3

HARDWARE BLOCK DIAGRAM

Jonah (EE)



COMPONENT SELECTION
PROCESSOR



FEATURE	Texas Instruments CC3235SF	Espressif ESP32-C6-WROOM-1-N8	Infineon CYW55912
Processor Core	ARM Cortex-M4	RISC-V	ARM Cortex-M33
Clock Speed	80 MHz	160 MHz	192 MHz
Wi-Fi Support	2.4 GHz and 5 GHz	2.4 GHz	2.4 GHz and 5 GHz
Wi-Fi Data Rate	16 Mbps	150 Mbps	143 Mbps
RAM	256 KB SRAM	512 KB SRAM	768 KB SRAM
Flash Storage	1 MB	8 MB	None
Relevant Peripheral Interfaces	1x I2C 1x SPI 2x UART 4x ADC 27x GPIO	1x I2C 2x SPI 3x UART 1x ADC (7ch) 30x GPIO	2x I2C 2x SPI 4x UART 7x ADC 47x GPIO
Documentation and Community Support	Low	High	Low

Jonah (EE)

DeAndre (CpE)

FEATURE	HC-SR501	AM312	EKMB11071112
Operating Voltage	5 - 12 V	2.7 - 12 V	3 - 5 V
Detection Range	6 meters	3 – 5 meters	0.1 - 6 meters
Power Consumption	65 mA	0.1 mA	3 mW
Response Time	0.3 - 5 min	<1 second	1 – 25 seconds
Size	32 x 24 mm	10 x 8 mm	15 x 10 mm
Cost	$10	$2	$8.7

COMPONENT SELECTION

PASSIVE INFRARED SENSOR

AM312 PIR sensor chosen for low cost, response time, power consumption, and small size.

COMPONENT SELECTION: NFC TRANSCEIVER


Cory (CpE)

FEATURE	PN532	ST25R3911B	CLRC663
Supported Standards	ISO/IEC 14443 Type A and B, Mifare, FeliCa, ISO/IEC 18092	ISO 18092, ISO 14443 Type A and B, ISO 15693	ISO/IEC 14443 A and B, ISO/IEC 18092, ISO/IEC15693, ISO/IEC 18000-3 mode 3, Felica, Mifare, NFCIP-1, EMVCo
Communication Modes	Reader/Writer, Peer-to-Peer, Card Emulation	Reader/Writer Peer-to-Peer	Reader/Writer Peer-to-Peer
Peak Data Rate (kbit/s)	424	6800	848
Host Interfaces	I2C, SPI, UART	SPI	I2C, SPI, UART
Max Power (mW)	820	1400	1125
Supported Range (cm)	7	10	12
Operating Temperature	-25 to 85 °C	-40 to 125 °C	-25 to 85 °C
Cost Per IC	$7.14	$6.48	$7.53

- PN532 is a popular RFID transceiver that supports the ISO/IEC 14443 standard necessary for Reader/Writer NFC communication
- Large amount of software support
- Support for all three common communication interfaces

COMPONENT SELECTION
SMART CARD


Cory (CpE)

- NTAG213 selected as total capacity is sufficient, and it is well-supported by PN532 and NFC libraries
- Commonly used for storing passkeys, URLs, and other identifying information

FEATURE	NTAG213	NTAG215	MIFARE CLASSIC
Supported Standards	ISO/IEC 14443	ISO/IEC 14443	ISO/IEC 14443-A
NFC Type	NFC Type 2	NFC Type 2	NFC Type 4
Total Capacity	180B	540B	1kB
Write Endurance	100000 cycles	100000 cycles	200000 cycles
Data Retention Time	10 years	10 years	10 years
Data Transfer Rate	106kbits/s	106kbits/s	106 kbits/s
Operating Distance	Up to 10cm	Up to 10cm	Up to 10cm
PN532 Support	Full Support	Full support, extra effort needed on software	Full support but requires emulation of NDEF format
Use Cases	Smart posters, authentication, URL storage	Amiibo, larger data storage	Public transit cards, access control, payment systems
Price	$11.99/20 cards	$10/20 cards	$8/10 cards

COMPONENT SELECTION: KEYPAD

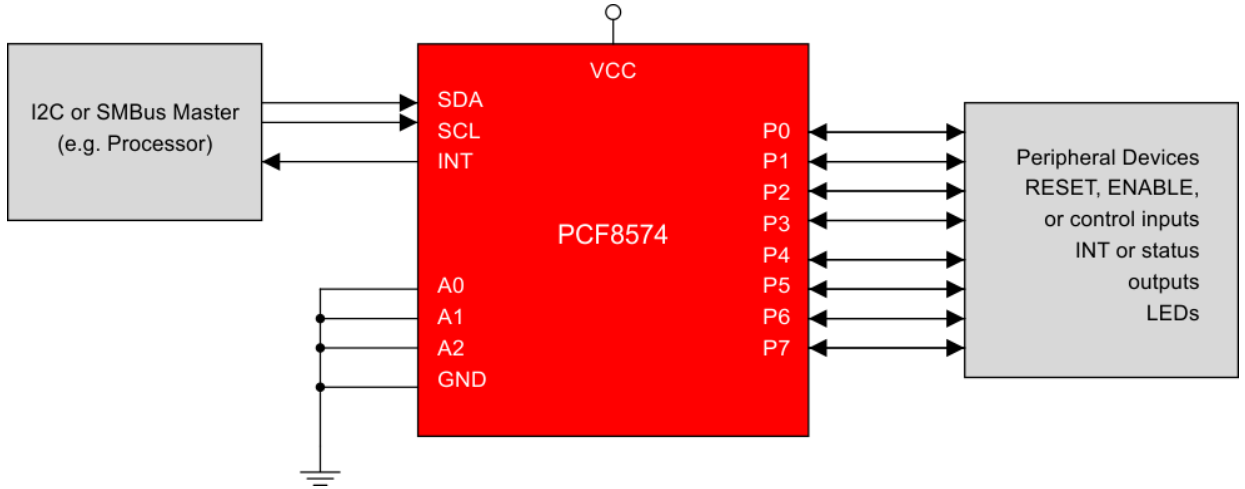
Cory (CpE)

Keypad Features	Membrane Keypad	Keypad Module Array	Pushbutton Matrix
Dimensions	69.2x76.9mm	60x55mm	43x38mm
Number of keys	4x4 (16)	4x4 (16)	4x4 (16)
Number of pins	8	8	8
Tactility	Low	Medium	High
Cost	$1.60	$7.89	$2.25

Cory (CpE)

COMPONENT SELECTION: IO EXPANDER

IO Expander Features	AW9523	PCF8574	MAX7314 ATG
GPIO Pins	16	8	18
Addressing Scheme	I2C, 4 addresses	I2C, 3 addresses	I2C, 2-wire serial
Interrupt Pin?	Yes	Yes	Yes
Clock Frequency	400kHz	100kHz	400kHz
Output sink/source current	37mA	1mA, 25mA	50mA
Cost	$4.95	$2.30	$2.53



COMPONENT SELECTION DISPLAY

Cory (CpE)

FEATURE	Teyleten Round TFT Display	Hiletgo TFT Display	Elegoo TFT Display with Touch Panel
Screen Size	1.28" Diameter	3.5”	2.4”
Resolution	240x240	480x320	320x240
Driver Chip	GC9A01	ILI9486/ILI9488	ILI9341
Color	Full RGB	Full RGB	Full RGB
Operating Voltage	3.3V/5V	5V/3.3V	5V/3.3V
Pin Count	7-pin	36-pin	26-pin
Min. # of GPIOs	5	24	18
Extra Features	Round Display	N/A	Resistive Touchscreen
Cost	$6.33	$18.50	$15.99

- Display selection criteria:
  - Responsiveness
  - Low power budget
  - Simple GPIO interface
  - Low cost

COMPONENT SELECTION
AUDIO FEEDBACK


Cory (CpE)

FEATURE	Active Buzzer	Passive Buzzer	Magnetic Speaker
Complexity	Low	Medium	High
Sound Range	Fixed Tone	Range of Tones	Real audio signals
Driving Method	Drive HIGH or LOW with GPIO	PWM Signal	GPIO and external amplifier circuit
Best For	Audio alerts	Alerts of various tones/melodies	Audio/Music Playback
Selected Component	CYT1036 5V Active Buzzer	160Ohm Passive Buzzer 3-5V	2W 8Ohm Round Magnet Speaker 2W

- A passive buzzer was chosen to generate distinct tones for check-in, check-out, administrator mode, and error states

Jonah (EE)

COMPONENT SELECTION
USB POWER DELIVERY

- USB Power Delivery selected for fast battery charging and compatibility with USB-C chargers
- Main selection criteria is low complexity

FEATURE	CYPD3171	CYPD3177	TPS25751
Input Voltage (V)	5 - 20	5 - 20	5 - 20
Role	Source & Sink	Sink	Source & Sink
Programmable Firmware	Yes	No	No
I2C Interface	Yes	Yes	Yes
Protection	OVP, OCP	OVP, OCP	OVP, OCP
Complexity	High	Low	Medium

Jonah (EE)

COMPONENT SELECTION POWER MANAGEMENT

- Main selection criteria is availability of documentation and support

FEATURE	MP2760	TI BQ25798	NXP PF1550
Charger Type	Buck-Boost	Buck-Boost	Buck
Input Voltage Range (V)	4 - 22	3.6 - 24	5
Charge Current (A)	4	5	1
MPPT for Solar Panel	No	Yes	No
Battery Cell Support	1-4 cells	1-4 cells	1 cell
Complexity	High	High	Low
Community Support and Reference Design Availability	Medium	High	Low

COMPONENT SELECTION
BATTERY

Jonah (EE)

FEATURE	XZNY-C1212	Talentcell LF4011	Talentcell LF060A1
Size (L x W x H)	5.95" x 2.56" x 3.7"	3.43" x 2.68" x 3.86"	2.76" x 1.85" x 3.94"
Capacity (Wh)	153.6	76.8	38.4
Nominal Voltage (V)	12.8	12.8	6.4
Cost	$39.99	$38.99	$21.99

- Battery technology and component selection criteria:
  - Safe to use at UCF
  - Low self-discharge
  - Compact design
  - Energy capacity to last multiple hours

System Schematic

Jonah (EE)

J2 Batt_Connector
J3 PV_Panel_Connector
PGND
BAT+
PV_IN
Power Management
BAT+
PV_IN
VDC_IN
SYSTEM
BQ25798_INT
SCL_BQ25798
SDA_BQ25798
I2C_SCL
I2C_SDA
Logic Power
SYSTEM
3.3V
5V
3.3V_SYS
5V_SYS
VDC
ERC Power Flags
3.3V_SYS
5V_SYS
3.3V_VDDD
1.8V_VCCD
AGND
PGND
Interface PCB Connector
J4
I2C_SCL
I2C_SDA
BQ25798_INT
PD_INT
UART_RXD
UART_TXD
J9
GPIO_BREAKOUT
GPIO7
GPIO8
GPIO6
Keypad
SCL_PCF8574
SDA_PCF8574
KEYPAD_INT
INT
NFC
SPI_CLK
SPI_MOSI
SPI_MISO
SPI_CS
NFC_INT
NFC_RST
Display & RGB
RGB_CTRL
SPI_CLK
SPI_MOSI
TFT_DC
TFT_CS
TFT_RST
USB Power Delivery
VBUS
CC1
CC2
VDC_OUT
SCL_PD
SDA_PD
PD_INT
SAFE_PWR
USB_VBUS
USB_CC1
USB_CC2
SAFE_PWR
J1
USB_C_16P_Connector
VBUS
CC1
CC2
D−
D+
SBU1
SBU2
A4–B9
A9–B4
A5
B5
A7
B7
A6
B6
A8
B8
USB_D−
USB_D+
GND
MH1
MH2
MH3
MH4
A1–B12
A12–B1
15
16
17
18
C1 10u
C2 0.1u
C3 1u
R1 3.3k
R2 2.2k
R3 2.2k
R4 10k
U1
ESP32-C6-WROOM-1-N8
3V3
EN
IO4
IO5
IO6
IO7
IO0
IO1
IO8
IO10
IO11
IO12
IO13
IO2
IO3
TXD0
RXD0
IO15
NC
IO23
IO22
IO21
IO20
IO19
IO18
IO9
CHIP_PU
I2C_SDA
I2C_SCL
GPIO6
GPIO7
GPIO8
BQ25798_INT
RGB_CTRL
TFT_RST
TFT_CS
TFT_DC
PIR_OUT
NFC_RST
NFC_INT
UART_TXD
UART_RXD
BUZZER_PWM
KEYPAD_INT
SPI_CS
SPI_MOSI
SPI_MISO
SPI_CLK
PD_INT
BOOT
BUZZER
BZ1 Buzzer
BUZZER_PWM
J5
PIR_CONNECTOR
PCB MOUNTING HOLES
H1
H2
H3
H4
USB-to-UART Bridge
USB_D−
USB_D+
UART_TXD
UART_RXD
RTS
DTR
Auto Download
RTS
DTR
CHIP_PU
GPIO9
BOOT
Protection Circuitry
USB_CC1
USB_CC2
USB_D+
USB_D−
USB_VBUS
Test Points
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
USB_VBUS
VDC
PV_IN
BAT+
SYSTEM
3.3V_SYS
5V_SYS

SCAN

Senior Design Group 35
Sheet: /
File: SCAN.kicad_sch
Title: SCAN PCB
Size: B
Date: 2025-02-25
Rev: 1.2
KiCad E.D.A. 8.0.6
Id: 1/10

USB Power Delivery

Jonah (EE)

Supply Decoupling Caps

3.3V_VDDD
C42 1u
C43 0.1u
C44 0.1u
PGND
1.8V_VCCD
C45 1u
PGND

VGS 10V Clamp

FET_SRC
R30 49.9k
D8 NZH10C-115
FET_GATE

5A Load Switch

Q7 IRF9358TRPBF
FET_SRC
FET_GATE
FET_GATE_EN
C50 1u
R39 10k
C51 1u
R40 0
R41 1k
VDC_OUT
R46 0
SAFE_PWR
FET2_SRC
Q8 BSL308PE
R42 49.9k
R43 1k
VBUS_FET_EN
SAFE_PWR_EN

VBUS
USB_VBUS
C48 3.3u
C49 100n
PGND

CC1
CC2
C46 390p
C47 390p
PGND

Power Sink Controller

U3 CYPD3177-24LQXQT

VBUS_IN
D-
D+
CC1
CC2
VBUS_MIN
VBUS_MAX
DNU1
DNU2
ISNK_COARSE
ISNK_FINE
VDDD
VCCD
VBUS_FET_EN
SAFE_PWR_EN
VDC_OUT
HPI_INT
HPI_SDA
HPI_SCL
GPIO_1
FAULT
FLIP
GND_1
GND_2
GND_3

USB PD

3.3V_SYS
R44 2k
R45 2k
PD_INT
SDA_PD
SCL_PD
PD_FAULT
PD_FLIP

USB_VBUS
D9 RED **Fault LED**
R48 1k
Q9 NTR4503NT1G
R47 100k
PGND

3.3V_VDDD
R31 5k
R32 1k
PGND

VBUS_MIN = 9V

VBUS_MIN
VBUS_MAX

3.3V_VDDD
R35 5.1k
R36 5.1k
PGND

ISNK_CRS
ISNK_FIN

3.3V_VDDD
R33 5k
R34 2.4k
PGND

VBUS_MAX = 12V

3.3V_VDDD
R37 DNP
R38 1k
PGND

ISNK = ISNK_CRS + ISNK_FIN
ISNK_CRS = 3A
ISNK_FIN = 0A

SCAN

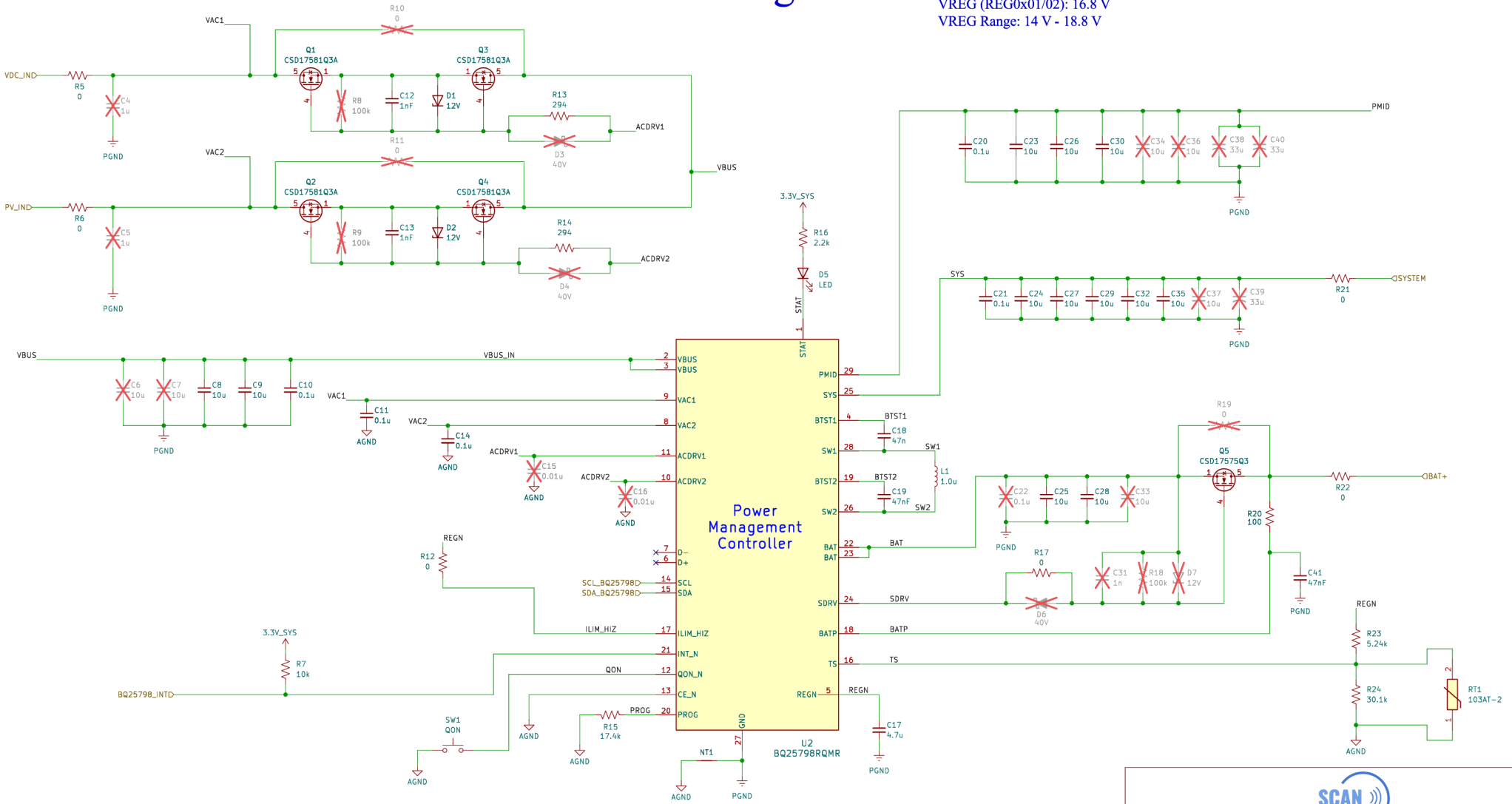
Senior Design Group 35
Sheet: /USB Power Delivery/
File: usb_power.kicad_sch
Title: SCAN PCB

Size: B	Date: 2025-02-25	**Rev: 1.2**
KiCad E.D.A. 8.0.6		Id: 4/10

Power Management

At POR and WDT reset...
Fsw = 1.5 MHz
Battery Cell Count (REG0x0A[7:6]): 4s
ICHG (REG0x03/04): 1 A
VSYSMIN (REG0x00[5:0]): 12 V
VREG (REG0x01/02): 16.8 V
VREG Range: 14 V - 18.8 V

Jonah (EE)



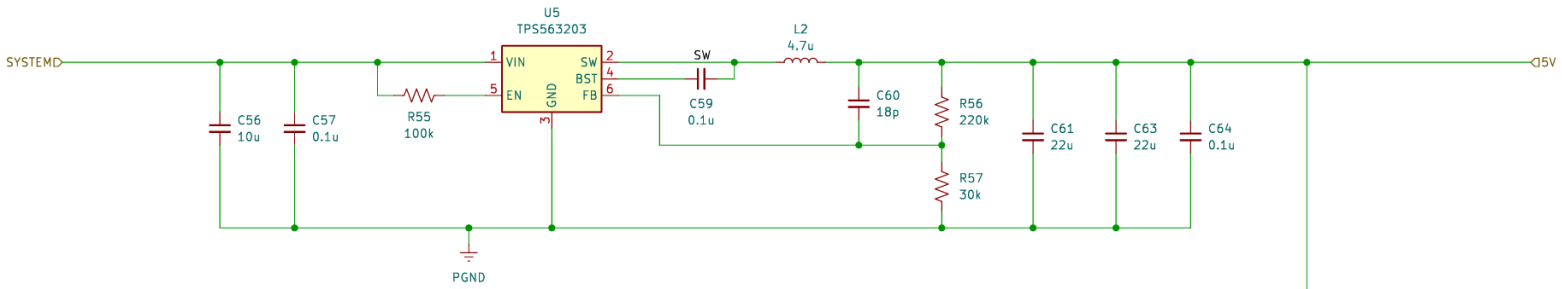
SCAN

Senior Design Group 35
Sheet: /Power Management/
File: power_management.kicad_sch
Title: SCAN PCB
Size: B | Date: 2025-02-25 | Rev: 1.2
KiCad E.D.A. 8.0.6 | Id: 2/10

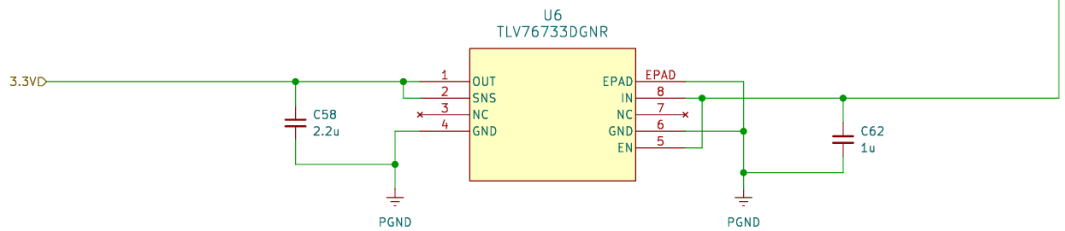
Jonah (EE)

Logic Power

Vin = 6.5 V - 17 V
Fsw = 600 kHz
Vout = 5 V
Iout(max) = 2.5 A

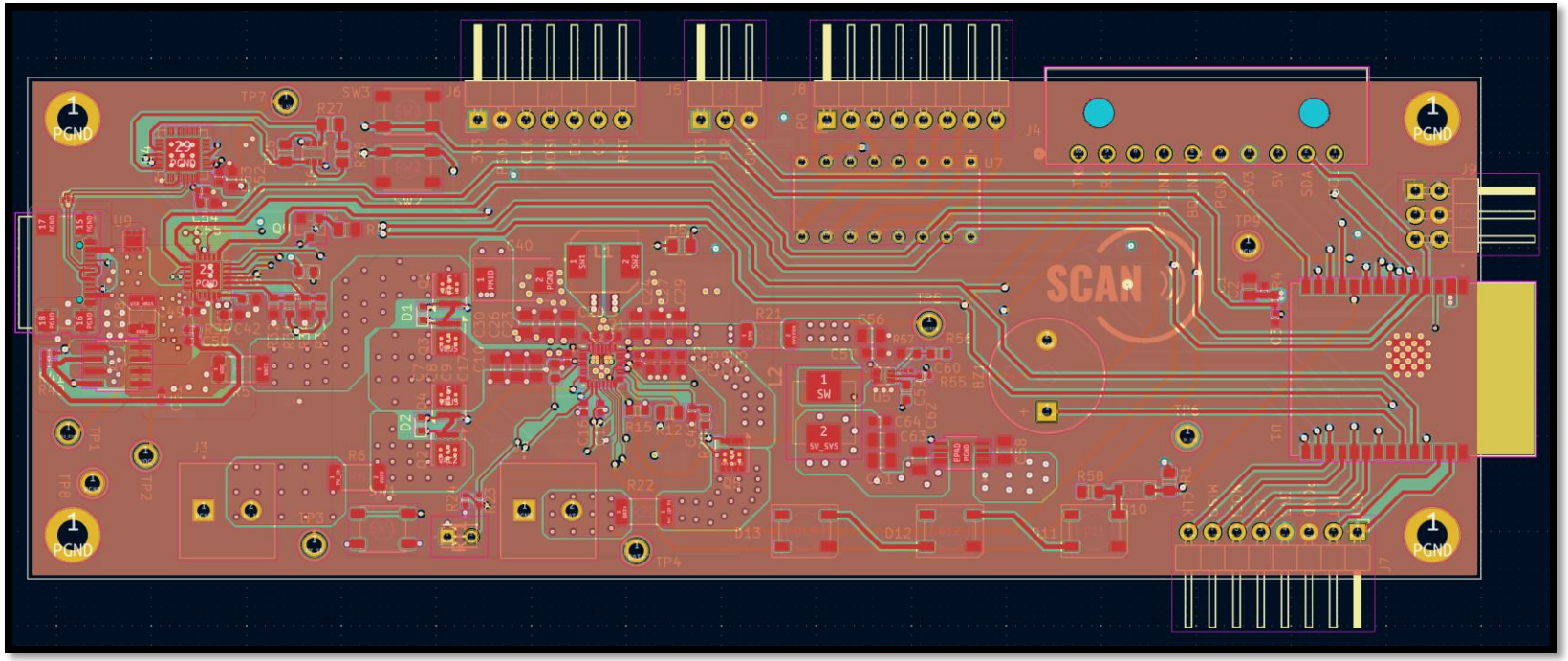


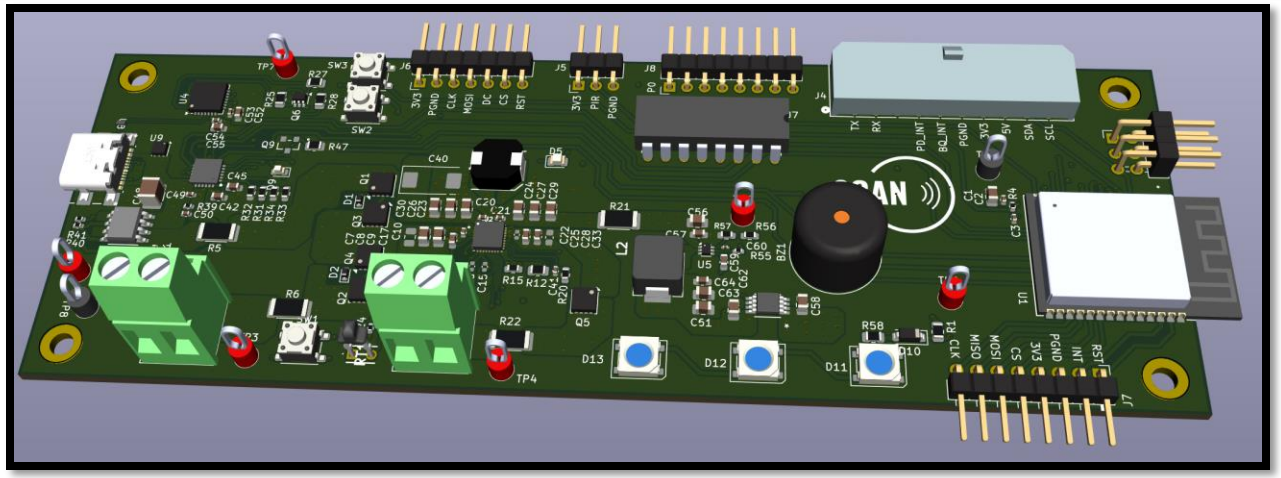
Vin = 5 V
Quiescent Current: 50 uA (typical)
Vout = 3.3 V
Iout(max) = 1 A



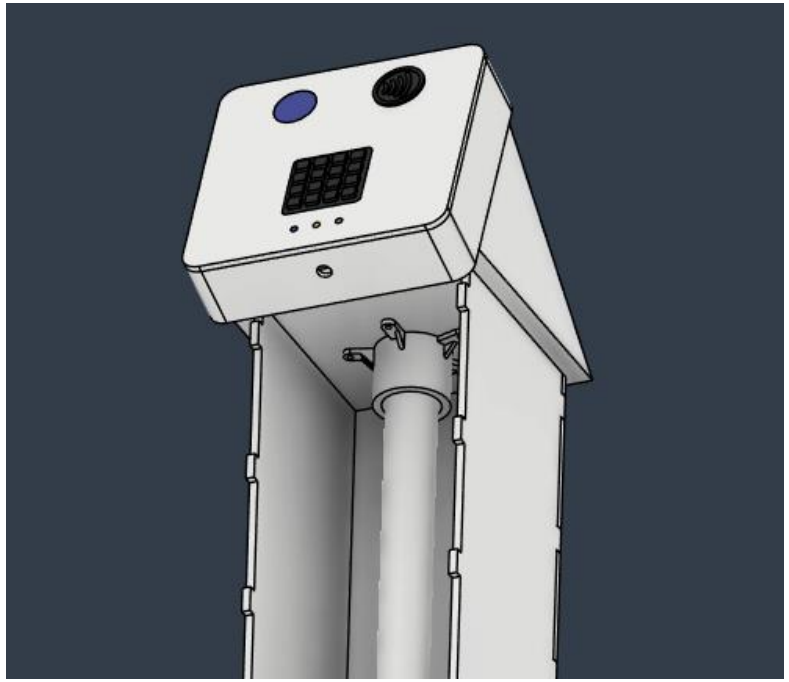
PCB LAYOUT AND 3D MODEL

Jonah (EE)

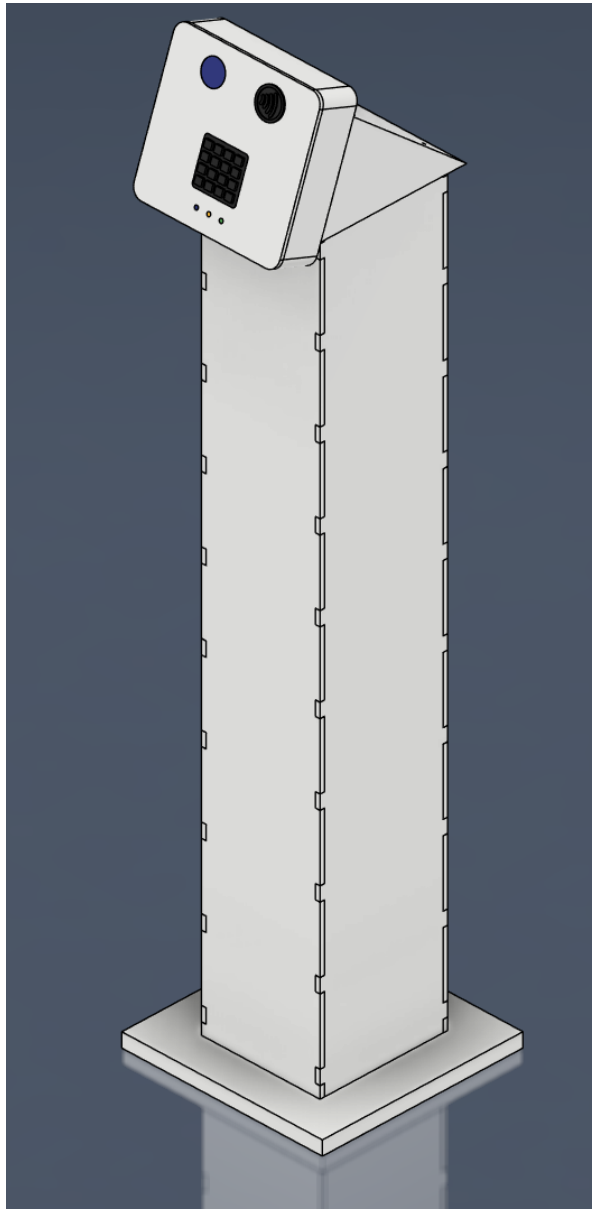




ENCLOSURE DESIGN



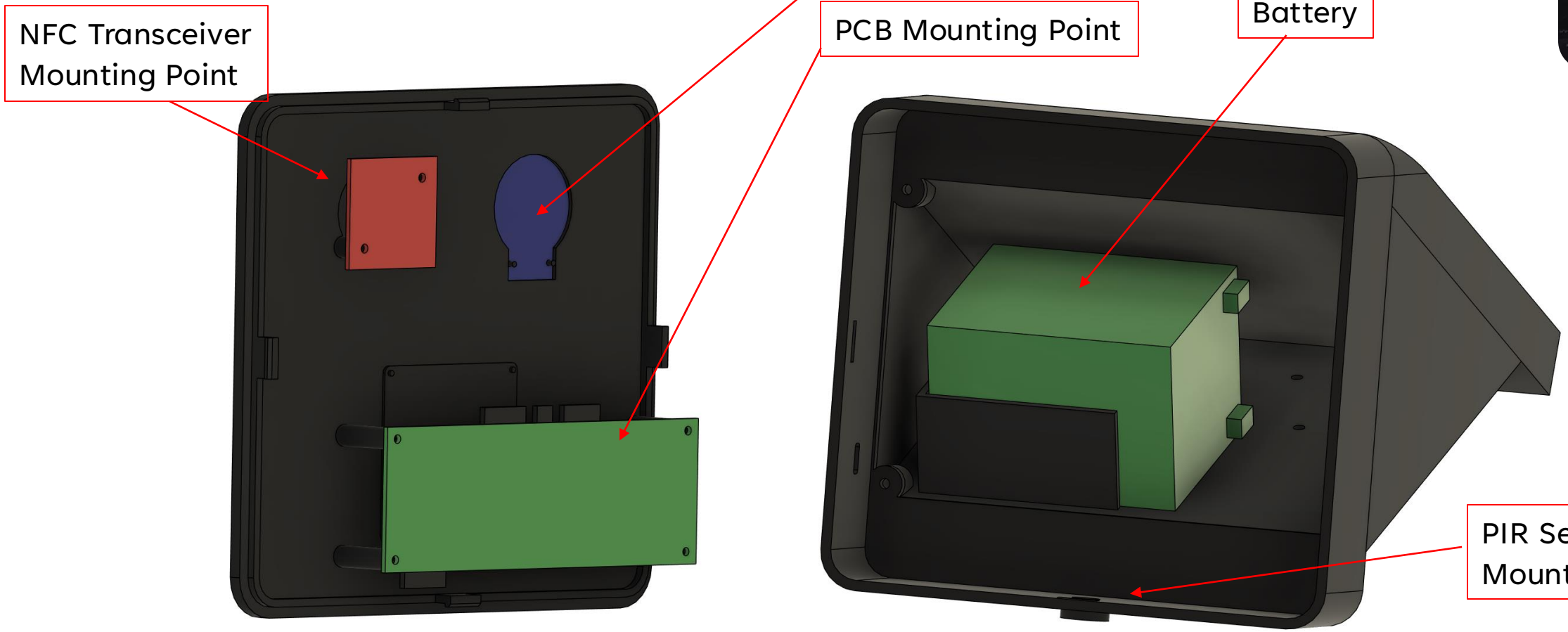
- Kiosk enclosure is mounted to base via a 3D-printed PVC flange and PVC pipe
- Body of base is created out of ¼” laser-cut plywood sheets
- Dimensions of enclosure come out to 11 ½” x 11” x 3’11”



Cory (CpE)

ENCLOSURE DESIGN

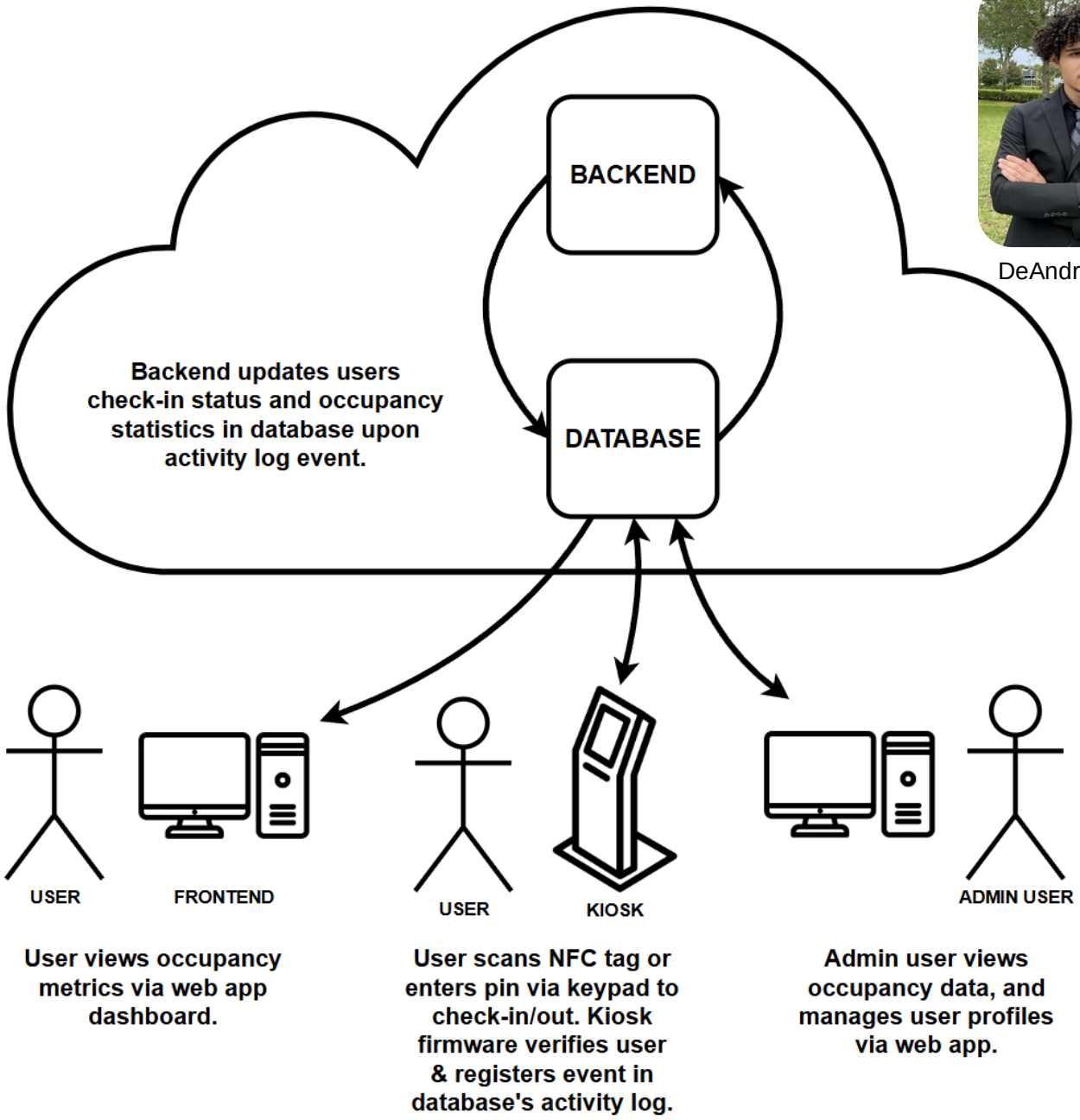
Cory (CpE)



- 3D-Printed Enclosure out of PLA filament
- Interlocking faceplate and base using toy tabs
- Peripherals attached using mounting standoffs with embedded nuts

SOFTWARE ARCHITECTURE DIAGRAM

DeAndre (CpE)



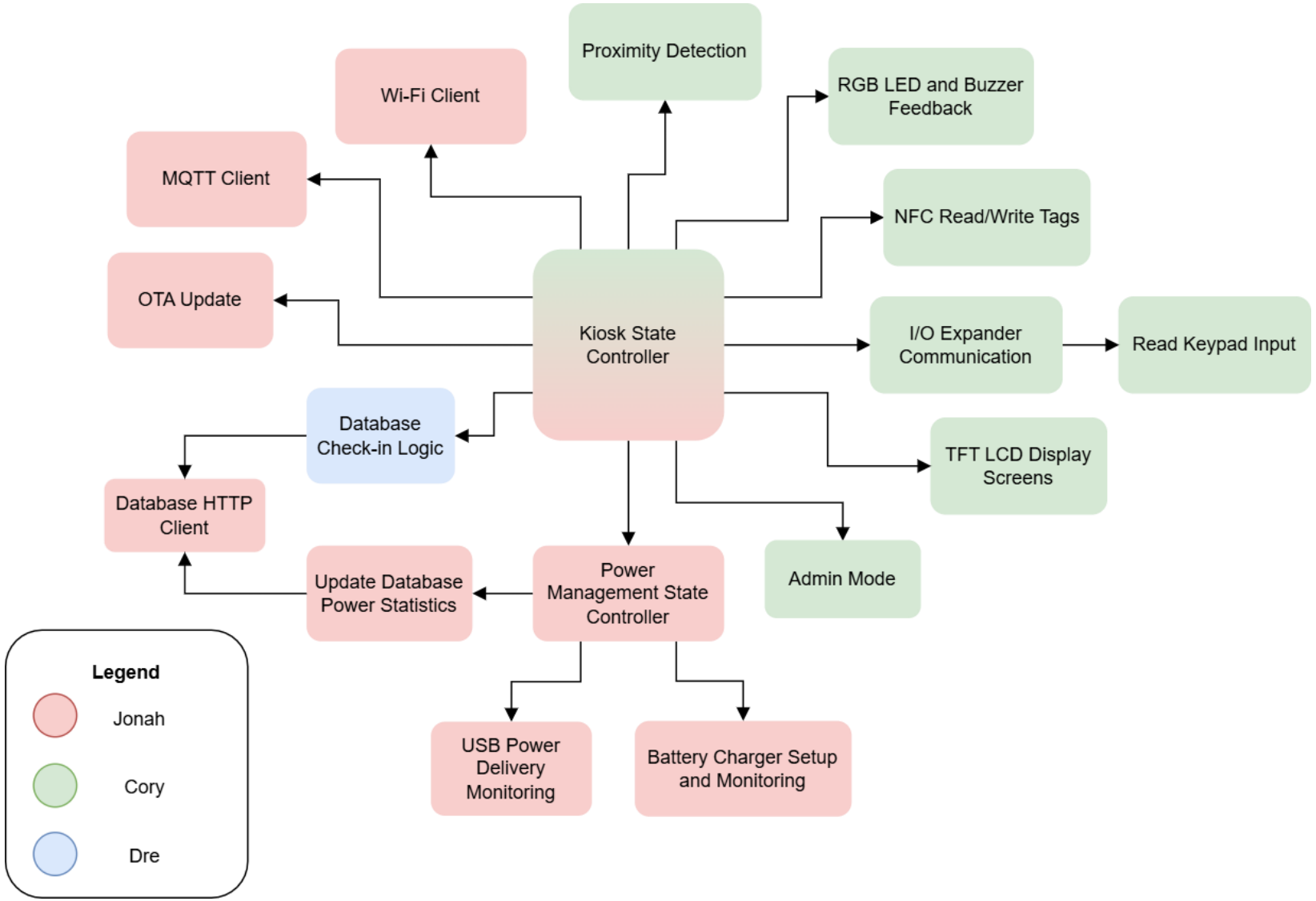
EMBEDDED IDE SELECTION

Jonah (EE)

Feature	Arduino IDE	**VSCode + PlatformIO (Arduino)**	VSCode + ESP-IDF
Setup Ease	Very simple, easy installation	Moderate setup required to configure for a specific board	More complex, manual ESP-IDF installation and config
Learning Curve	Beginner-friendly	Moderate	Steeper
Supported Framework	Arduino	Arduino Core but with more configuration	Native ESP-IDF, direct access to ESP32 hardware features
Debugging	Limited to serial output and logging	Improved debugging via VSCode extensions	Advanced debugging with GDB, real-time trace, and monitoring tools
Build System	Mostly hidden	Customizable PlatformIO build system	CMake/Ninja
RTOS Support	Limited	Similar to Arduino IDE	Full integration of FreeRTOS for task management, synchronization, and real-time operations
IDE Features	Text editor with limited library management	VSCode features such as intellisense, library management, and unit testing	Real-time monitoring, profiling, and component management
Community Support	High community support	Moderate community with good documentation	Direct support from Espressif with growing developer community

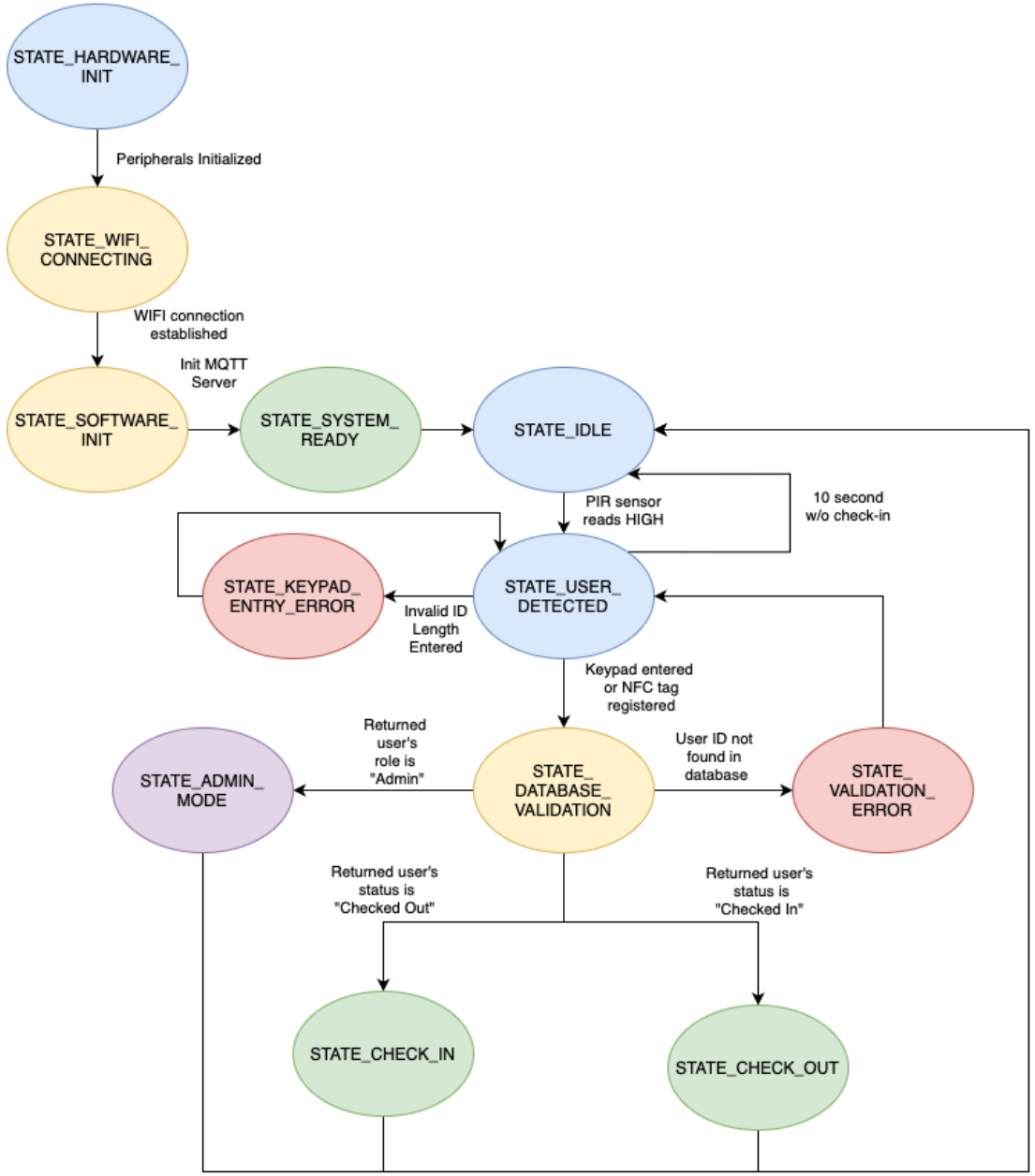
SOFTWARE BLOCK DIAGRAM

Jonah (EE)



KIOSK FIRMWARE MAIN STATE MACHINE

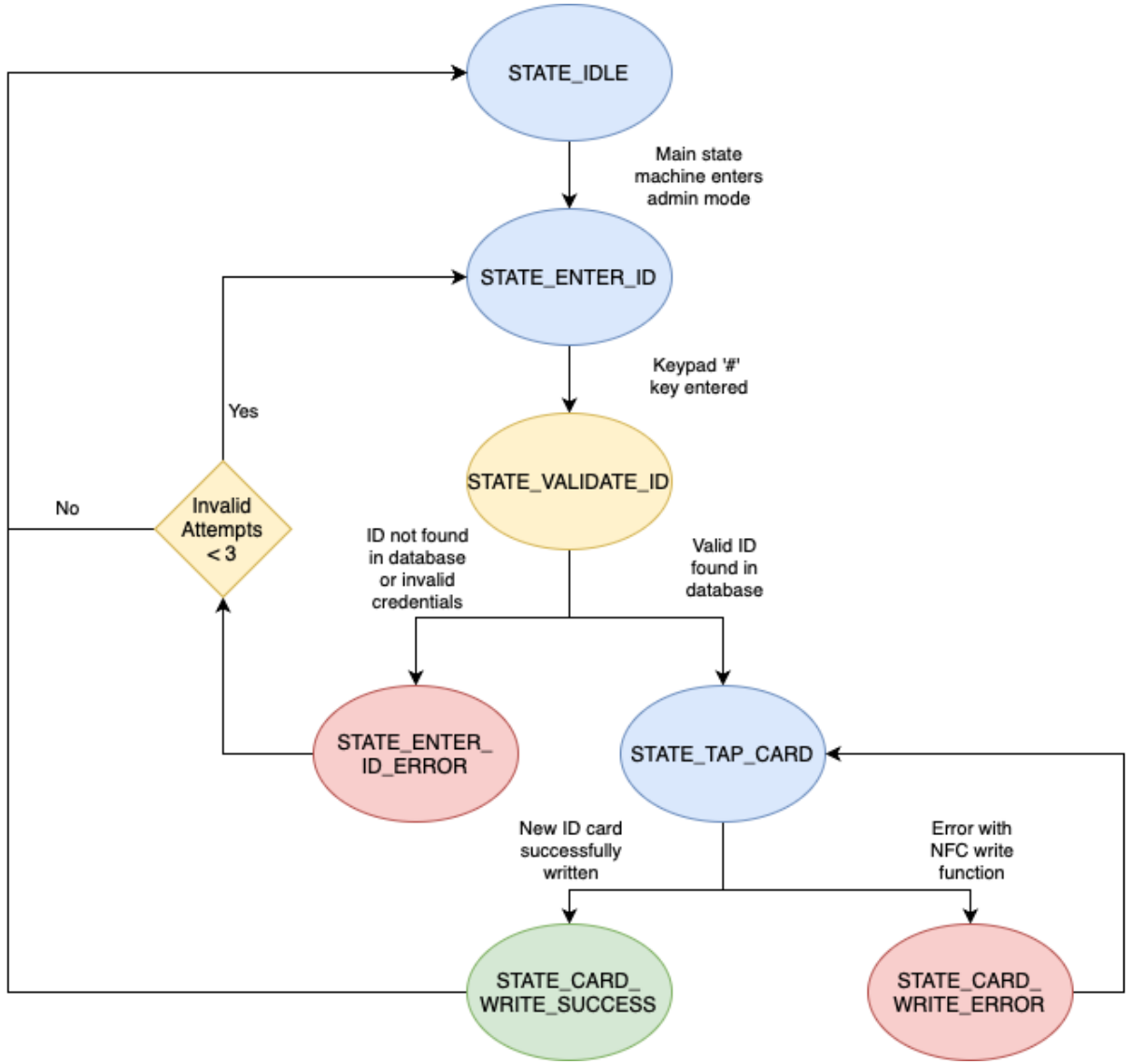
Cory (CpE)



KIOSK ADMIN MODE

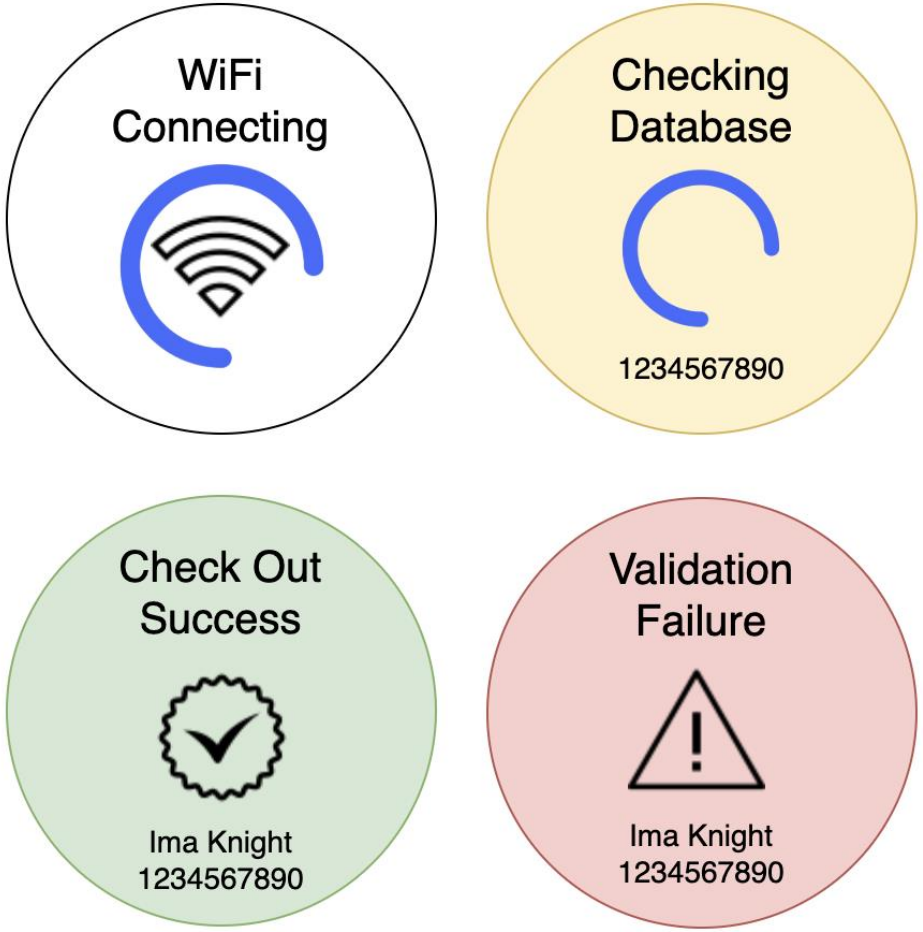
Cory (CpE)

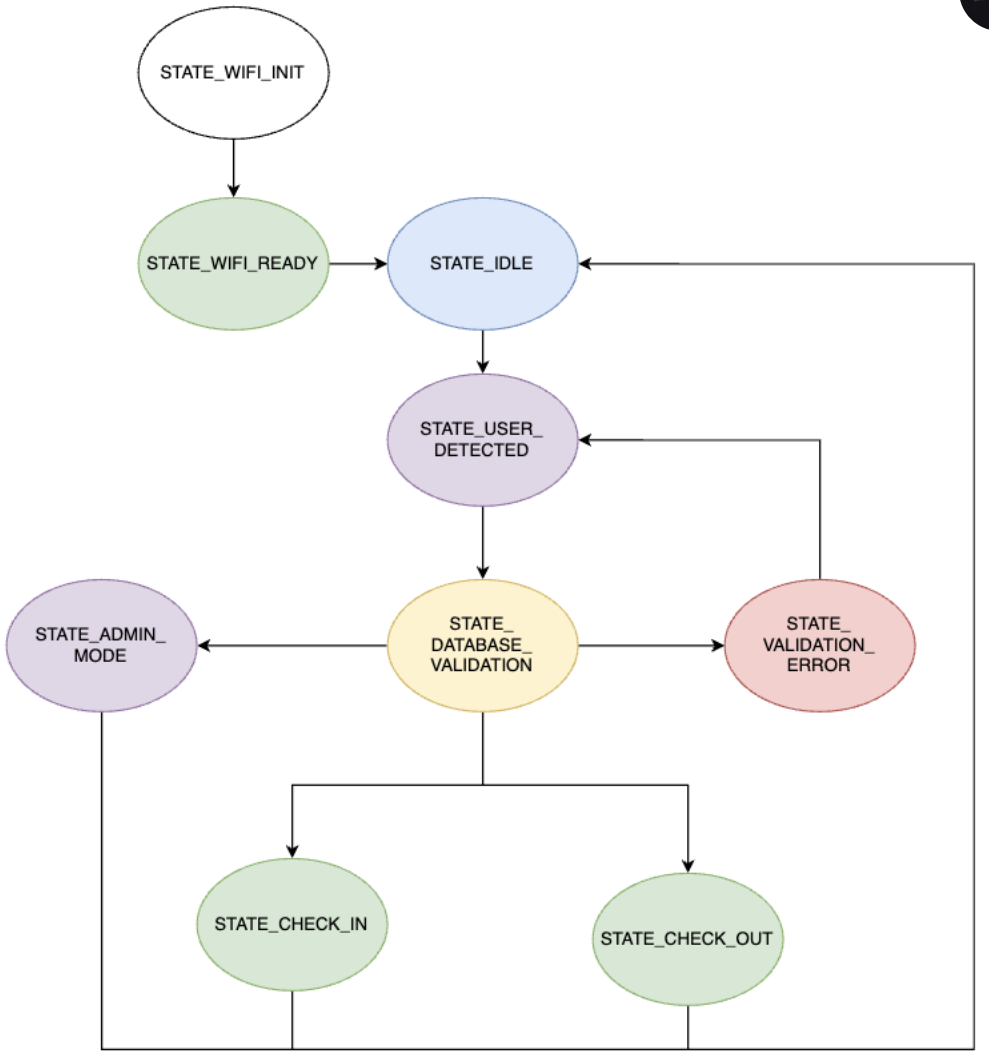
- Used to write new ID cards for an existing user in the database
- Triggered from the main state machine when a system admin taps or enters their admin ID



EMBEDDED GUI DESIGN WITH LVGL

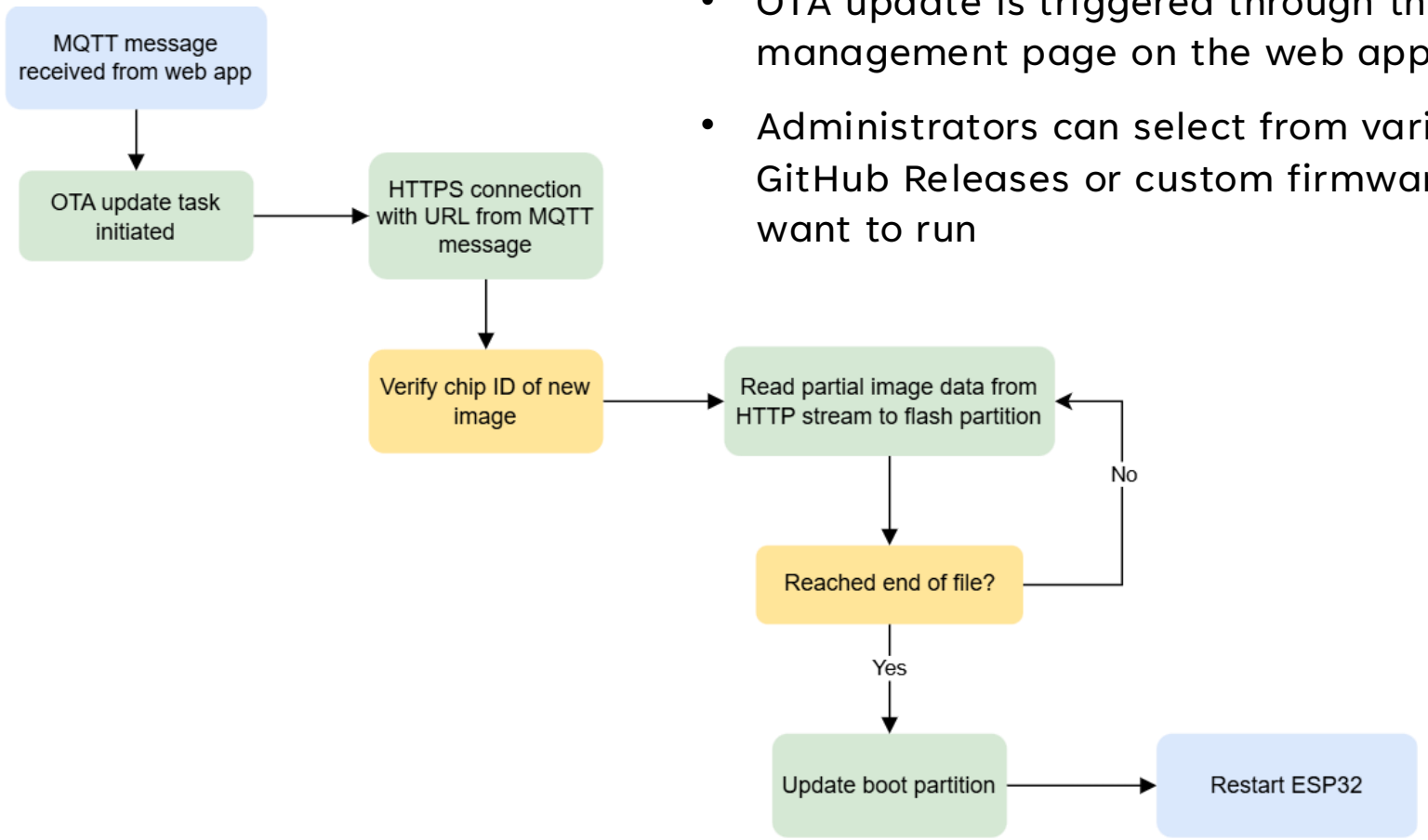
Cory (CpE)





FIRMWARE OVER-THE-AIR UPDATES

Jonah (EE)



- OTA update is triggered through the kiosk management page on the web app
- Administrators can select from various GitHub Releases or custom firmware they want to run

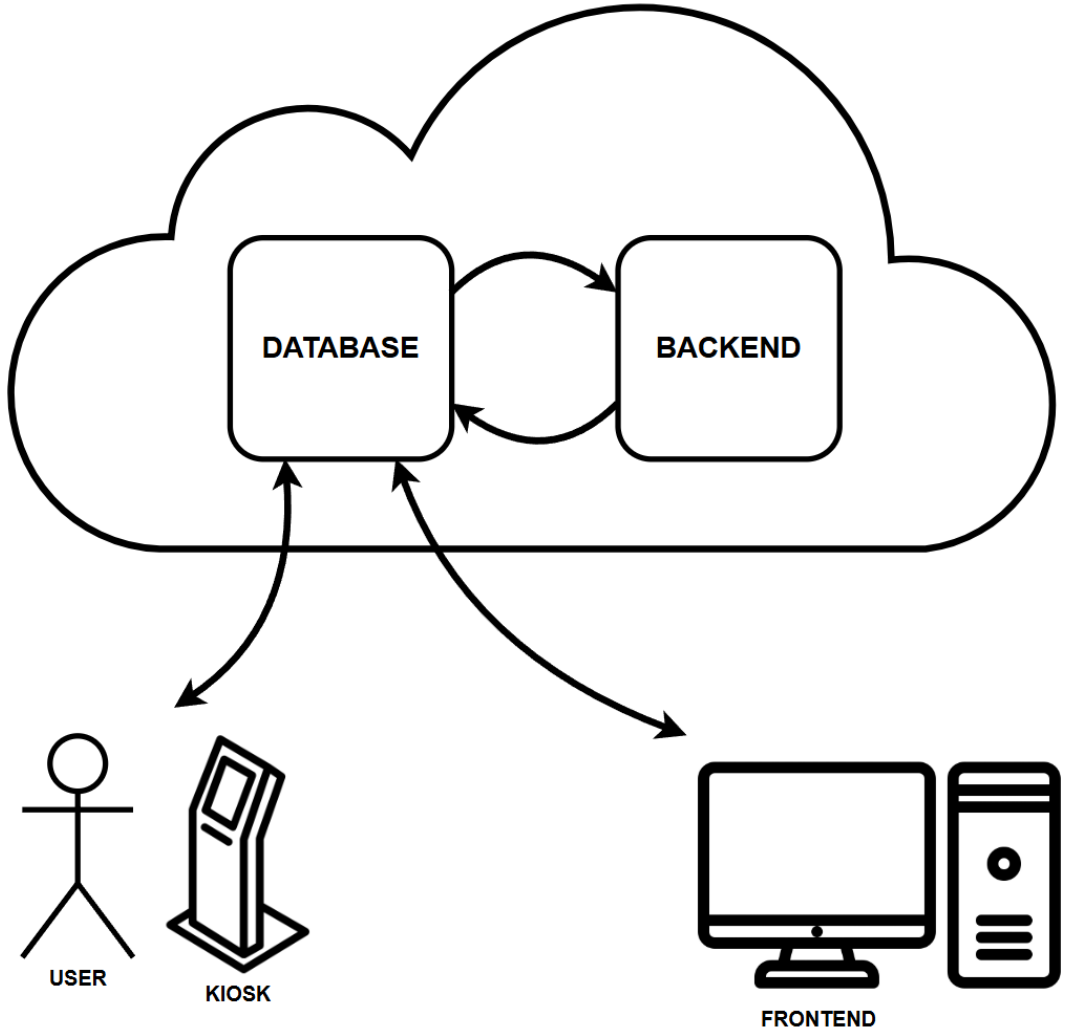
DeAndre (CpE)

WEB APP STACK

FRONTEND

BACKEND

DATABASE



DeAndre (CpE)

TECHNOLOGY COMPARISON

WEB APP FRONTEND

ReactJS chosen primarily due to:

- Group familiarity
- Online support and resources
- Ease of integration with other components in the Firebase ecosystem, like Firebase real-time database, hosting, and Cloud Functions.

FEATURE	Angular	Vue	ReactJS
Key Features	Two-way data binding, Dependency injection	Reactive binding, Virtual DOM	Component-based, Virtual DOM
Ease of Use	Low - Steep learning curve, small community	Easy learning curve, quickly growing	Easiest – group familiarity, large community
Performance	Slightly slower	Fast	Fast and lightweight
Ease of Firebase Integration	Moderate	Easy	Easy

DeAndre (CpE)

FEATURE	Firebase Realtime Database	Firebase Firestore	Microsoft Azure
Data Model	NoSQL (JSON tree)	NoSQL (Documents and Collections)	NoSQL (Multiple models)
Real-Time Sync	Best for real-time updates	Supports real-time but slower	Limited (Change Feed for near real-time updates)
Deployment	Cloud-based (Managed by Firebase)	Cloud-based (Managed by Firebase)	Fully managed (Azure Cloud)
Cost	Free tier available, pay-as-you-go for large apps	Free tier available, pay-as-you-go for large apps	Higher cost, but flexible pricing models
Implementation Complexity	Simple (built-in integration with Firebase SDKs)	Slightly more complex than Realtime DB	More complex due to multiple database models

TECHNOLOGY COMPARISON

DATABASE

Firebase Realtime Database chosen for minimal cost, responsive real-time updates, and ease of integration with frontend, backend, and Firebase hosting

DeAndre (CpE)

TECHNOLOGY COMPARISON

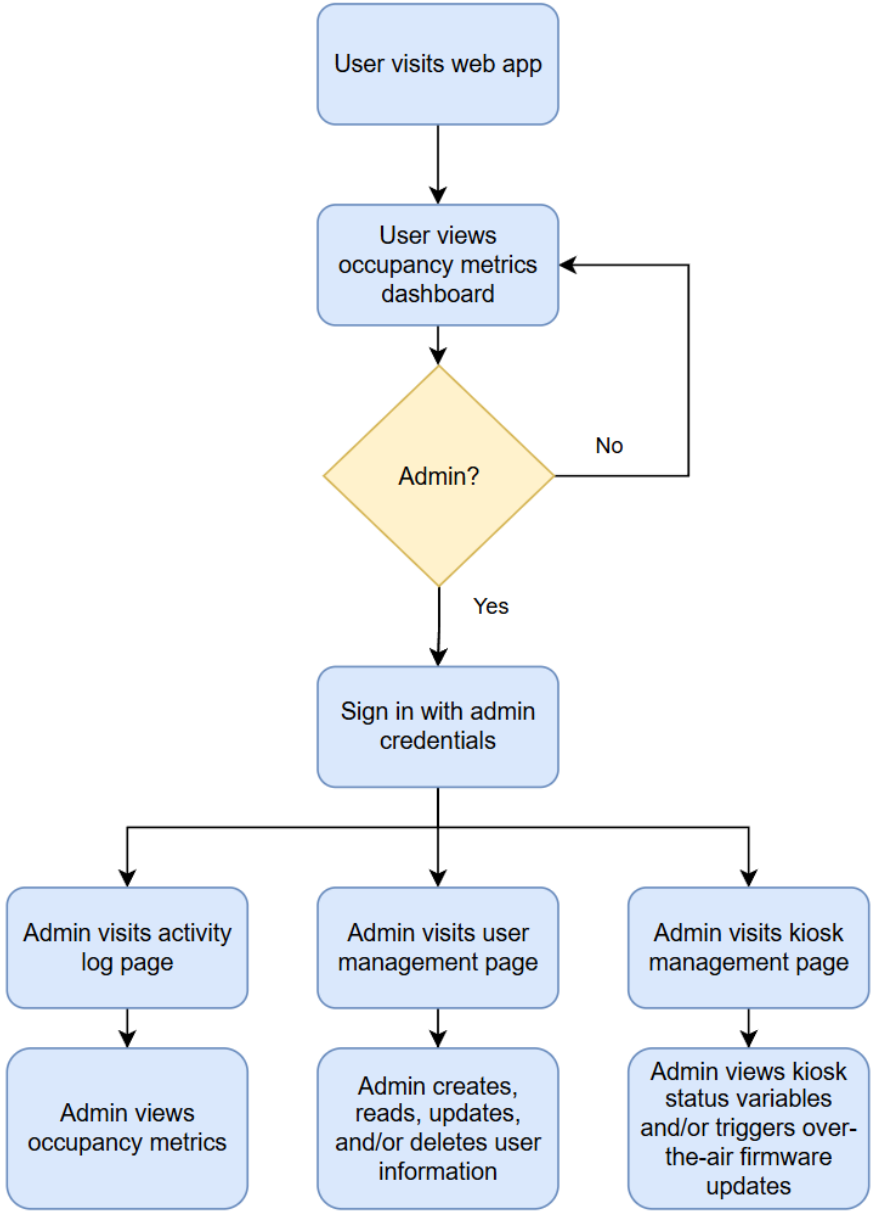
WEB APP BACKEND

Firebase Cloud Functions for low implementation complexity and ease of integration with Firebase Realtime Database

FEATURE	Express.js on VPS	Firebase Cloud Functions	AWS Lambda
Complexity	High, requires hosting and setup	Low, serverless	Medium
Cost	Fixed server costs	Limited free tier, then pay-as-you-go	Potentially high – pay-as-you-go
Real-time Capabilities	Requires WebSockets	Built-in	Requires WebSockets
Security	Google authentication & IAM	Manual implementation, built-in traffic encryption	IAM roles

WEB APP FRONTEND DESIGN

- 4 navigable pages
- Admin sign-in (optional)
- Implemented using the Firebase SDK for updating displayed statistics immediately in-sync with database



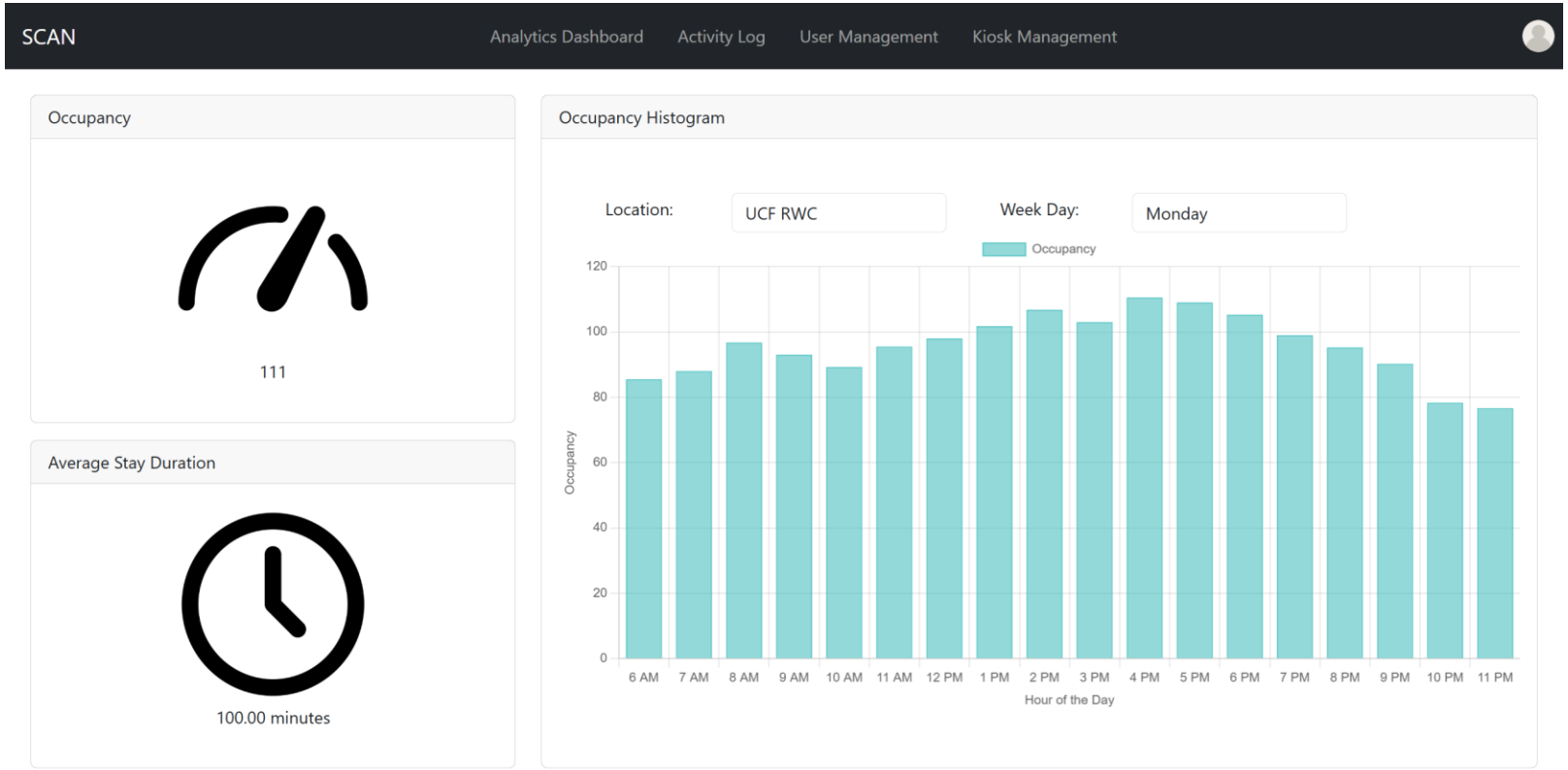
DeAndre (CpE)

DeAndre (CpE)

WEB APP ANALYTICS DASHBOARD

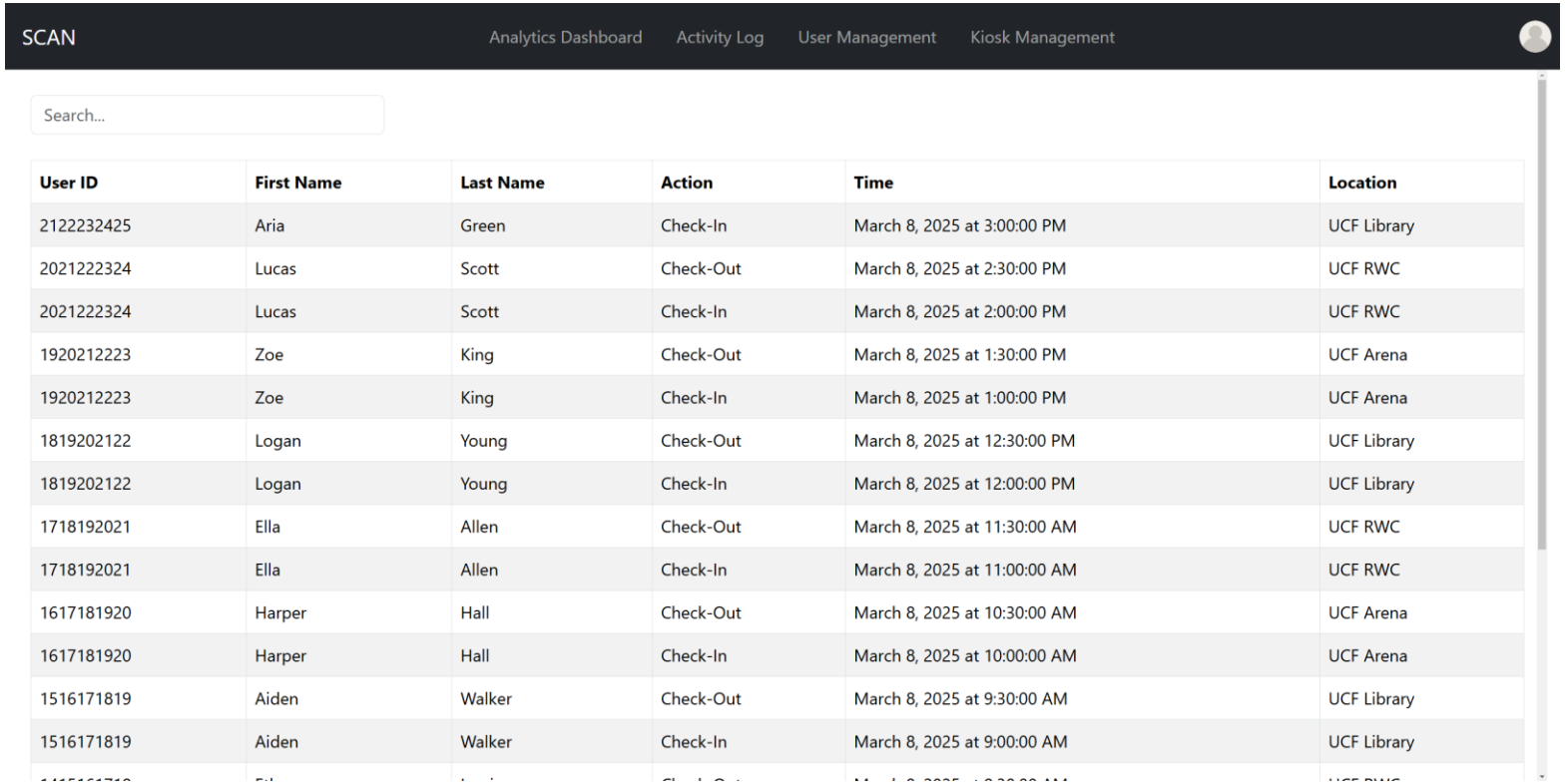
Wireframe shows intended design encompassing a variety of metrics including:

- Live occupancy
- Average stay duration
- Occupancy histogram



DeAndre (CpE)

WEB APP
ACTIVITY LOG



User ID	First Name	Last Name	Action	Time	Location
2122232425	Aria	Green	Check-In	March 8, 2025 at 3:00:00 PM	UCF Library
2021222324	Lucas	Scott	Check-Out	March 8, 2025 at 2:30:00 PM	UCF RWC
2021222324	Lucas	Scott	Check-In	March 8, 2025 at 2:00:00 PM	UCF RWC
1920212223	Zoe	King	Check-Out	March 8, 2025 at 1:30:00 PM	UCF Arena
1920212223	Zoe	King	Check-In	March 8, 2025 at 1:00:00 PM	UCF Arena
1819202122	Logan	Young	Check-Out	March 8, 2025 at 12:30:00 PM	UCF Library
1819202122	Logan	Young	Check-In	March 8, 2025 at 12:00:00 PM	UCF Library
1718192021	Ella	Allen	Check-Out	March 8, 2025 at 11:30:00 AM	UCF RWC
1718192021	Ella	Allen	Check-In	March 8, 2025 at 11:00:00 AM	UCF RWC
1617181920	Harper	Hall	Check-Out	March 8, 2025 at 10:30:00 AM	UCF Arena
1617181920	Harper	Hall	Check-In	March 8, 2025 at 10:00:00 AM	UCF Arena
1516171819	Aiden	Walker	Check-Out	March 8, 2025 at 9:30:00 AM	UCF Library
1516171819	Aiden	Walker	Check-In	March 8, 2025 at 9:00:00 AM	UCF Library

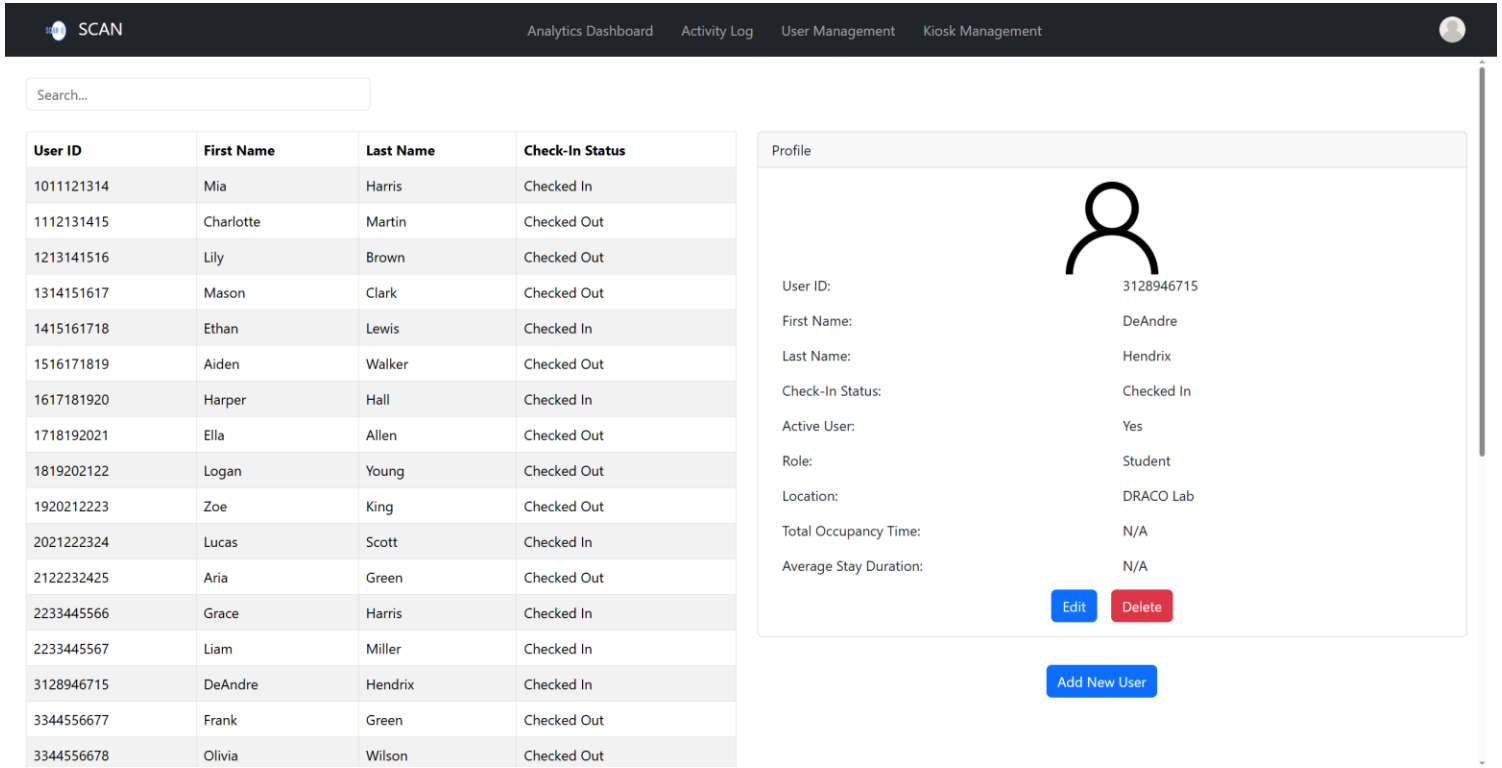
Allows administrative users to view an actively updated log of check-in/out events

Details user ID, name, action, time, and location.

DeAndre (CpE)

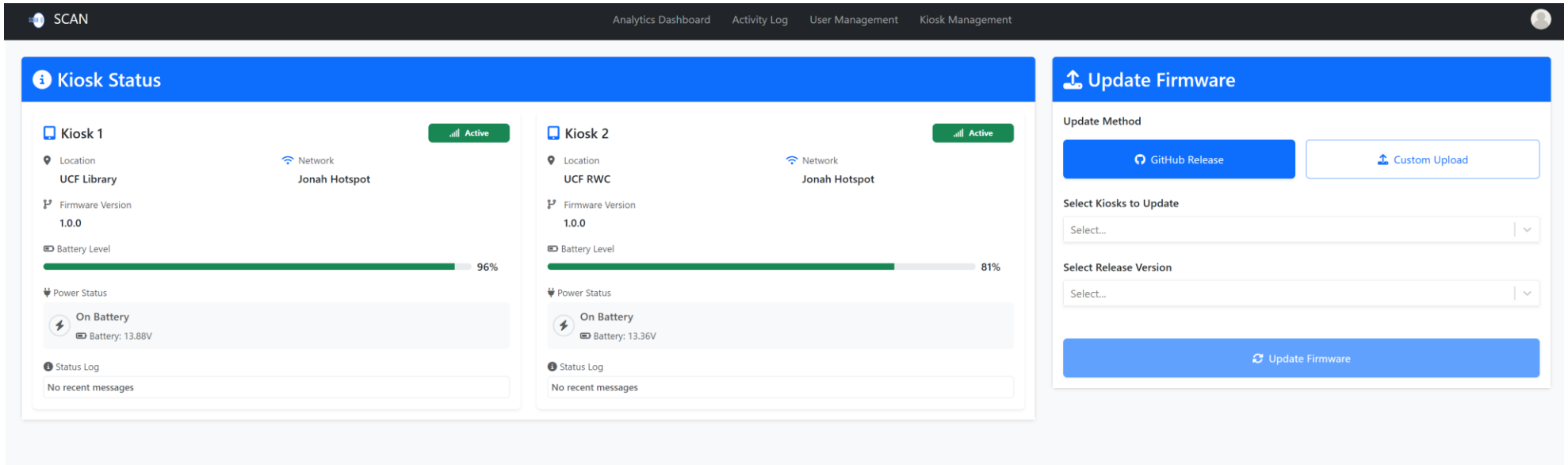
WEB APP
USER MANAGEMENT

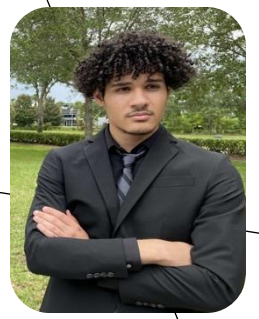
Allows admin users to search, view, create, update, and delete user profiles



Jonah (EE)

WEB APP
KIOSK MANAGEMENT





DeAndre (CpE)

DATABASE SCHEMA

Activity Log

- **Activity ID**
  - User ID
  - Action
  - Timestamp
  - Location

Users

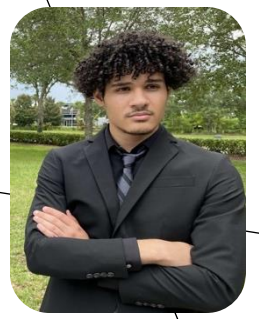
- **User ID**
  - First Name
  - Last Name
  - Check-In Status
  - Location
  - Role
  - Total Check In Time
  - Number of Visits

Kiosks

- **Kiosk ID**
  - Active
  - Battery Level
  - Charging Status
  - Firmware Version
  - Location
  - Network SSID
  - USB PD Contract

Stats

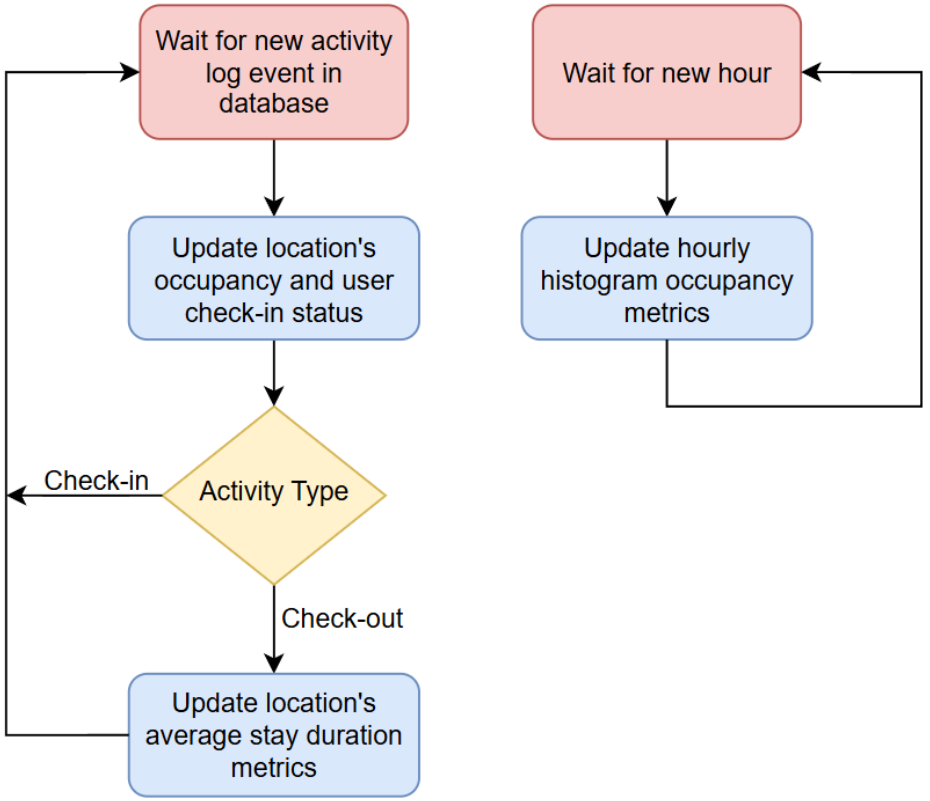
- **Average Stay Data**
  - **Location**
    - Number of Visits
    - Total Time
- **Histogram Data**
  - **Location**
    - **Day**
      - Hour
- **Occupancy**
  - Location



DeAndre (CpE)

BACKEND DESIGN

1. Kiosk pushes check-in/check-out event to Activity Log in Firebase Realtime Database
2. Firebase Cloud Functions are triggered to update statistics and user profile



BUDGET AND SPENDING (PER KIOSK)


Cory (CpE)

PROJECTED BUDGET

Part	Quantity	Cost
PCBA and Components	1	~$30.00
JLCPCB tax and shipping	1	~$20.00
NFC Transceiver	1	$6.33
ID Cards	10	$9.99
Display	1	$6.33
Keypad	1	$7.89
Proximity Sensor	1	$2.90
Buzzer	1	$0.60
Battery	1	$20.00
USB C Cable	1	$5.99
PLA Filament	1	N/A
PVC Pipe	1	$14.99
Total Cost		**127.01**

FINAL BILL OF MATERIALS

Part	Quantity	Cost
PCBA and Components	1	$92.70
JLCPCB tax and shipping	1	$44.58
PN532 NFC Transceiver	1	$5.63
NTAG213 NFC Cards	20	$11.99
Round TFT Display	1	$6.00
Keypad Module	1	$7.89
Passive IR Sensor	1	$2.90
Passive Buzzer	1	$0.70
12V LiFePO4 Battery	1	$31.99
USB C Cable	1	$5.99
PLA Filament	1	$14.99
PVC Pipe	1	$14.99
¼” Plywood Panels	1	$29.88
Screws and Assorted Fixtures	1	$15.00
Total Cost		**$285.23**

WORK DISTRIBUTION


Jonah (EE)

TEAM MEMBER	ROLES	
Cory Brynds (Computer Engineering)	* Embedded software: NFC, SPI, display, keypad, buzzer, PIR sensor, RGB LEDs, admin mode	Senior Design Website Page
	Kiosk enclosure design	Project Lead
DeAndre Hendrix (Computer Engineering)	* Web app: analytics dashboard, user management page, activity log	Embedded software: database check-in logic
	Database structure and web app integration	Video Editing
Jonah Sprandel (Electrical Engineering)	* Schematic design and PCB layout	Web app: kiosk management page
	Embedded software: HTTP, Wi-Fi, MQTT, OTA updates, I2C, USB PD, power management	Framework/DevOps: Docker, ESP-IDF, CI/CD pipeline

* Primary Responsibility

THANKS FOR LISTENING! ANY QUESTIONS?

Dr. Lei Wei
Associate Professor

Project Advisor

Dr. Mike Borowczak
Associate Professor

Project Review Committee

Dr. Sonali Das
Lecturer

Project Review Committee

Dr. Piotr Kulik
Assistant Professor

Project Review Committee