



CRITICAL DESIGN REVIEW

GROUP 27

KYLE DENNIS DAT TRAN

TYLER CLAITT KORY MARKS

Project Responsibilities

Kyle Dennis (CpE):

- Web Application
- Font end development



Tyler Claitt (CpE):

- System communication
- Back-end development



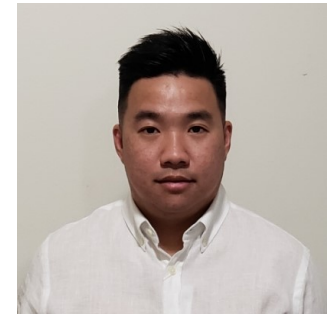
Kory Marks (EE):

- Design schematic
- Ordering components



Dat Tran (EE):

- Prototyping and testing
- Auto display data on the LCD screen



Administrative Introduction



- IntelliDate is a wall mounted display, providing the user with an automatically updating calendar.
- Users can add, edit, and remove events to and from their calendar, via one of their devices, with the IntelliDate application.

Motivation



- Using a wall-mounted calendar has proven to be effective in keeping track of daily tasks and deadlines.
- Many times, it is difficult or impossible to fit all of the tasks and deadlines for a specific day into its designated box, on the whiteboard.
- Erasing and re-dating the calendar every month is a tedious and manual chore.

Goals and Objectives



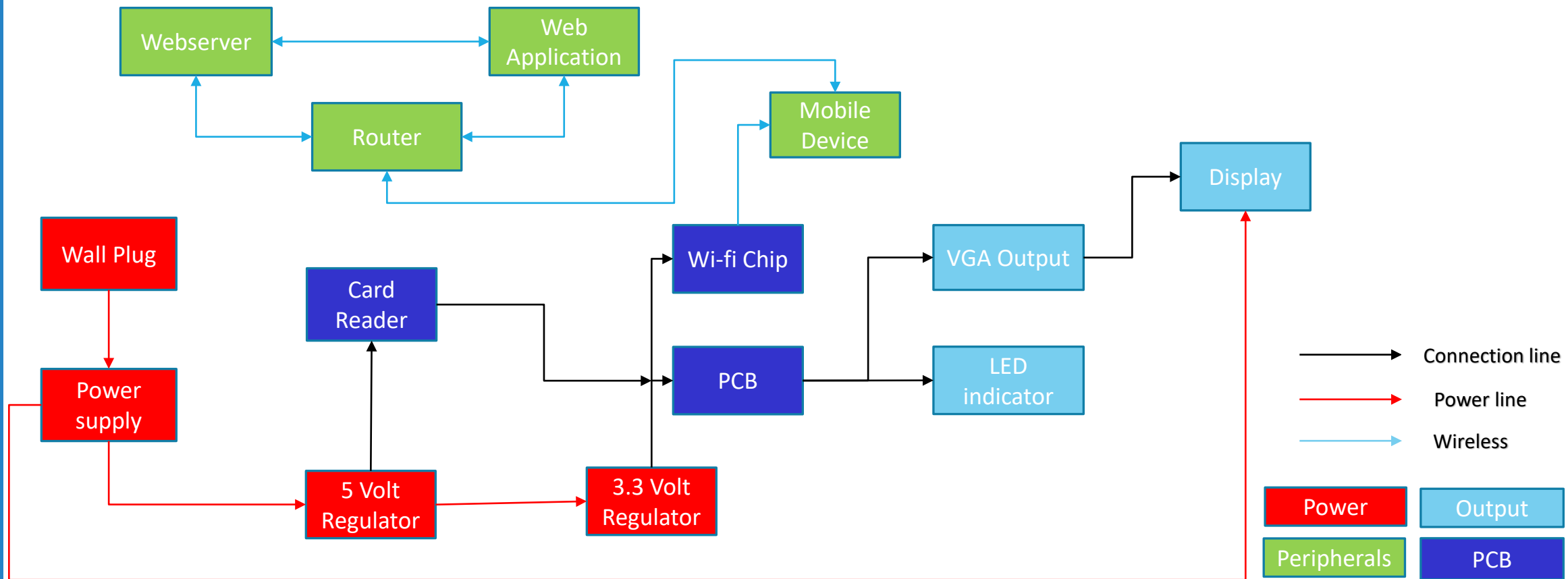
- Develop IntelliDate software application to communicate with IntelliDate display, allowing users to:
 - Create/edit/delete events
 - Configure brightness of display
 - Change active view of display (monthly, weekly, daily)
 - Lock/unlock visibility of IntelliDate display
- Modify traditional computer monitor to act as IntelliDate display, allowing the monitor to:
 - Communicate with IntelliDate software application
 - Display a monthly, weekly, and daily calendar view
 - Automatically update as events are added/edited/deleted via the IntelliDate software application

Specifications



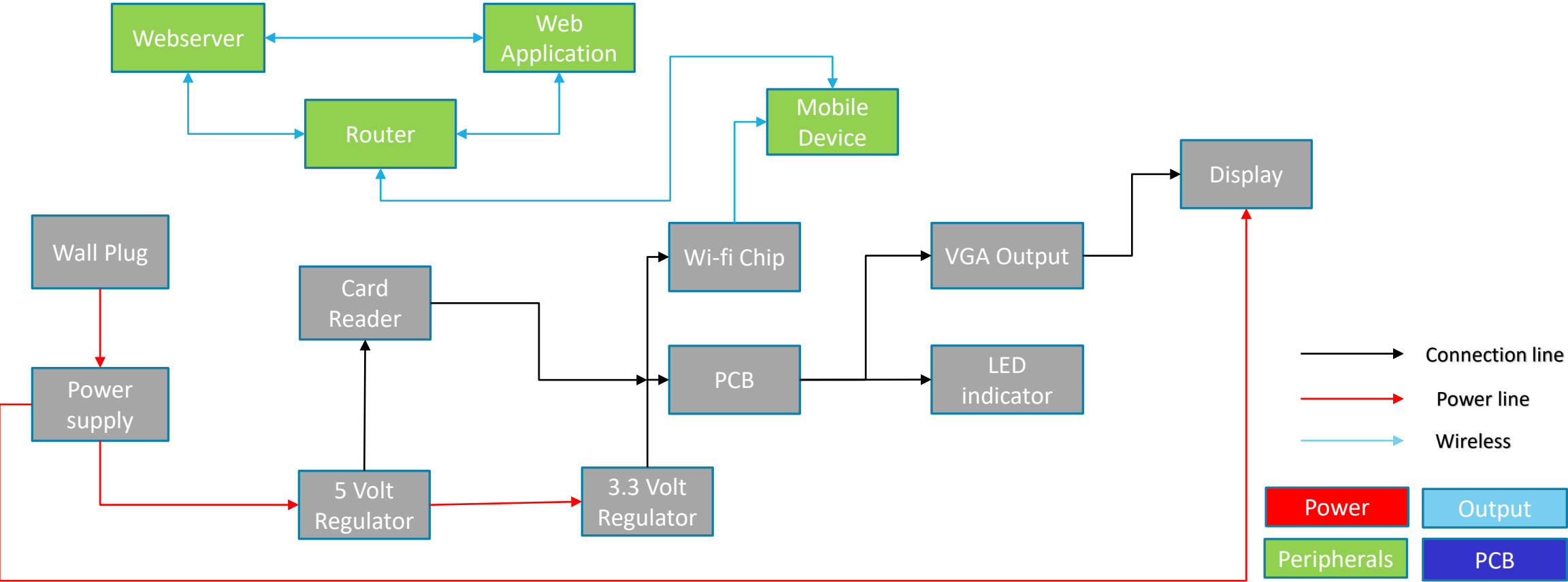
Component	Parameter	Design Specification
Display	HDMI	Up to 4k
Wireless	Minimum range	20 ft
Web Application	Update time	No longer than 1 seconds
Data transfers	Update time	1 seconds
SD card	Storage	32 GB

Overall Block Diagram





Software Application



Web Application vs. Mobile Application



■ Web App

- Data stored on hosting server
- Accessed through Web browser
- Accessible via desktop or mobile device
- Requires active Internet connection
- Easier to host application on 3rd party server than hosting mobile application on software distribution platforms
- One variant of application will function for all operating systems with a Web browser (HTML, CSS, JavaScript)

■ Mobile App

- Data stored on mobile device
- Accessed through native mobile device environment
- Only accessible via mobile device
- Offline capabilities
- Must be approved by owners of mobile operating systems to be hosted on software distribution platforms (“app stores”)
- Multiple variants of application must be made for various mobile operating systems (Objective-C or Swift for iOS; Java for Android)

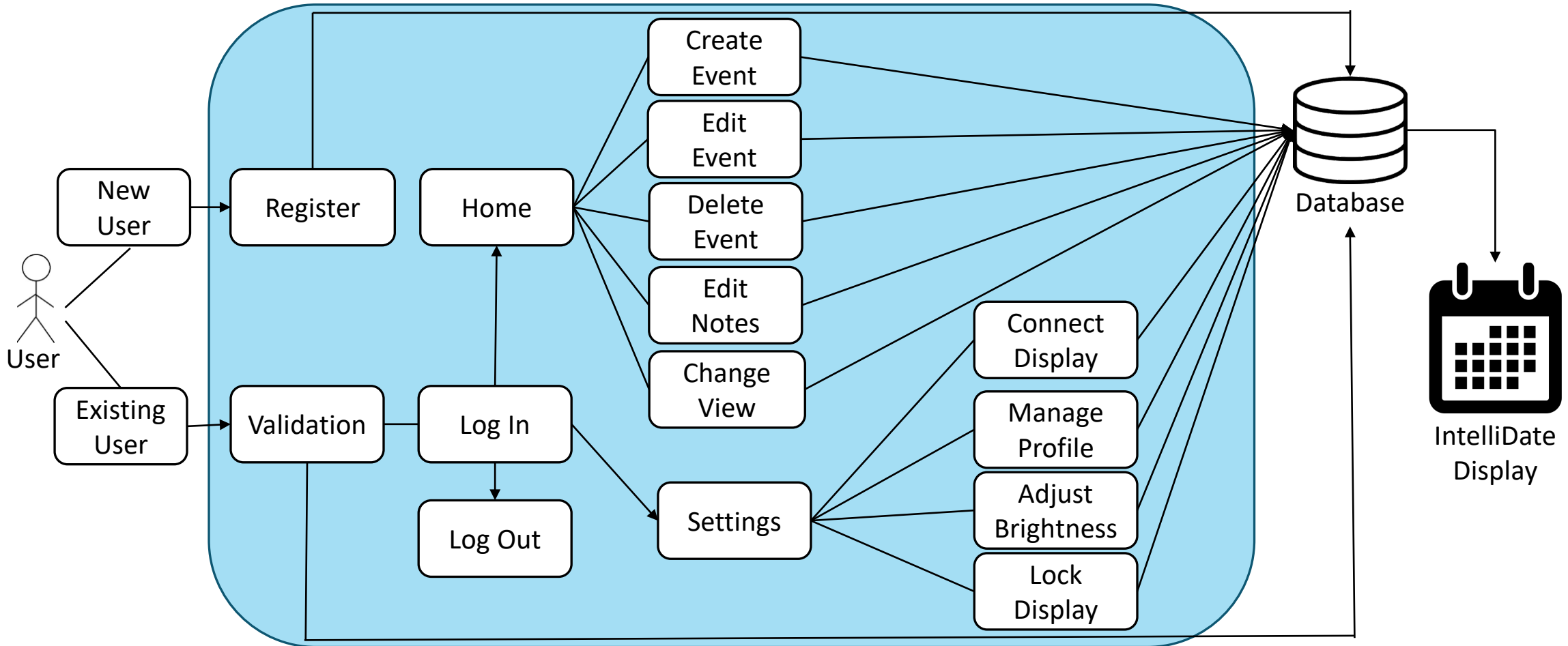
Web Application Features



- Create IntelliDate account
- Link IntelliDate display to account
- Configure IntelliDate display settings (network, brightness, calendar view)
- Create, edit, and delete calendar events that are reflected on the IntelliDate display
- Edit Notes
- Lock/unlock IntelliDate display
- Manage IntelliDate account settings



Use Case Diagram



Web Application Demo



A screenshot of a web browser displaying the IntelliDate login page. The browser's address bar shows 'localhost:3000/login'. The page has a dark blue header with the 'INTELLIDATE' logo on the left and a 'LOGIN' button on the right. The main content area is light grey and features a large IntelliDate logo in the center. Below the logo is a white 'Log In' form with two input fields labeled 'Email' and 'Password', a 'Log In' button, and a 'New User?' link at the bottom.

Hardware Components



Arduino MD or Uno?



Uno specification:

- Atmega328p
- 8 bits
- 28 pin
- SRAM: 2 KB
- Clock Speed: 16MHz
- Operating Voltage: 3.3V
- Memory Flash: 32 KB
- Digital I/O Pins: 14

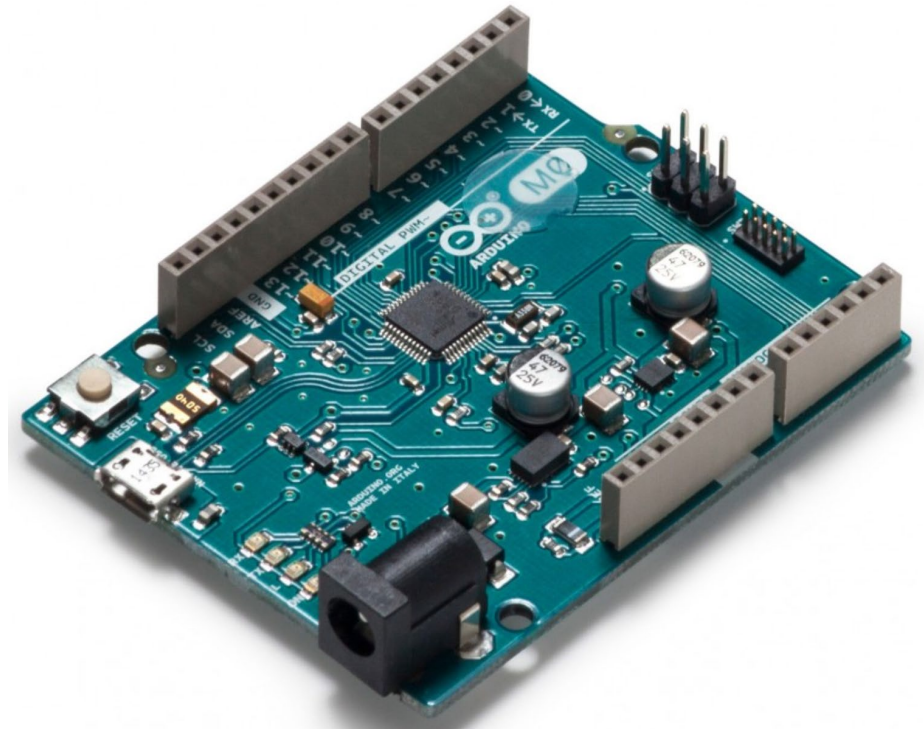


Arduino M0 or Uno?

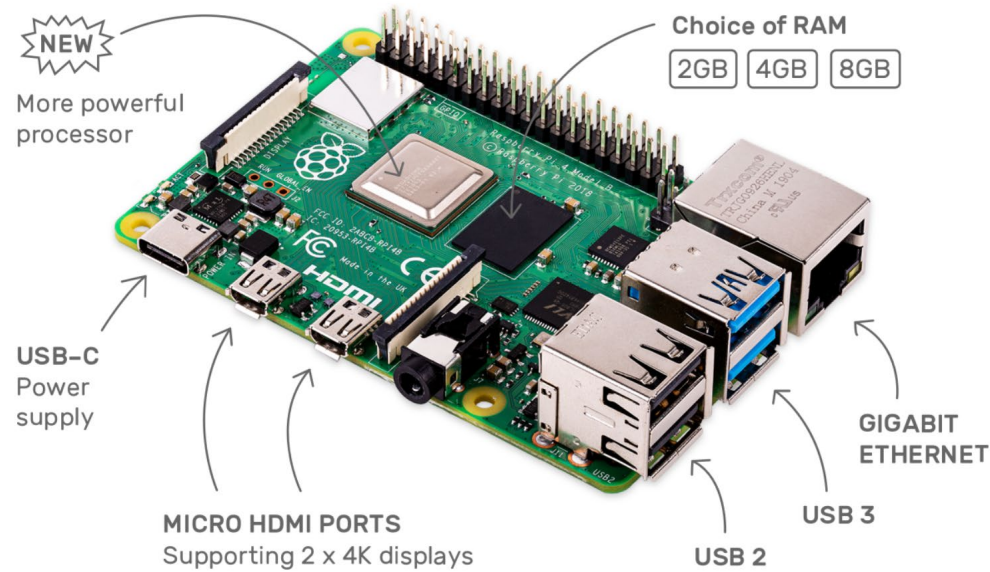


M0 Specification:

- Atmel's SAMD21 MCU
- 32-bit Cortex
- 48 pin
- SRAM: 32 KB
- Clock Speed: 48MHz
- Operating Voltage: 3.3V
- Flash Memory: 256 KB
- Digital I/O Pins: 14, with 12 PWM and UART



Raspberry Pi 4



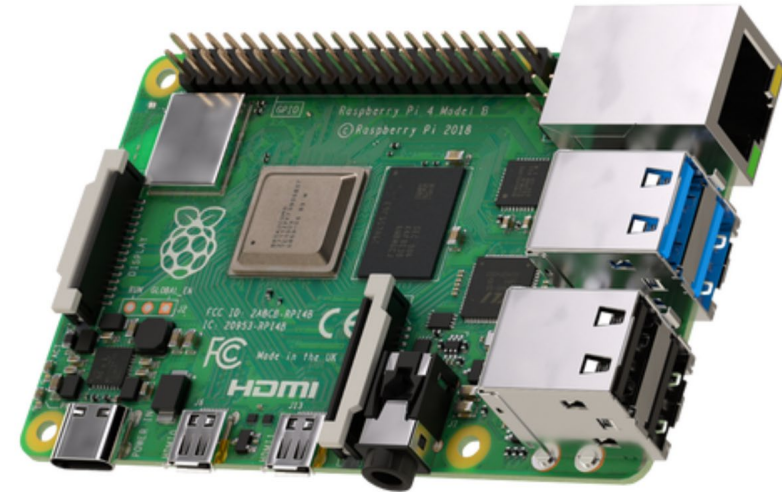
Specification:

- Broadcom BCM2711, Quad core 64 bits 1.5Ghz
- 1GB SDRAM
- 2 USB 3.0 and 2 USB 2.0 ports
- HDMI ports
- Micro HDMI ports
- 5V DC (USB and pin headers)
- Wireless connection
- 5V, 2.5 Amp supply power

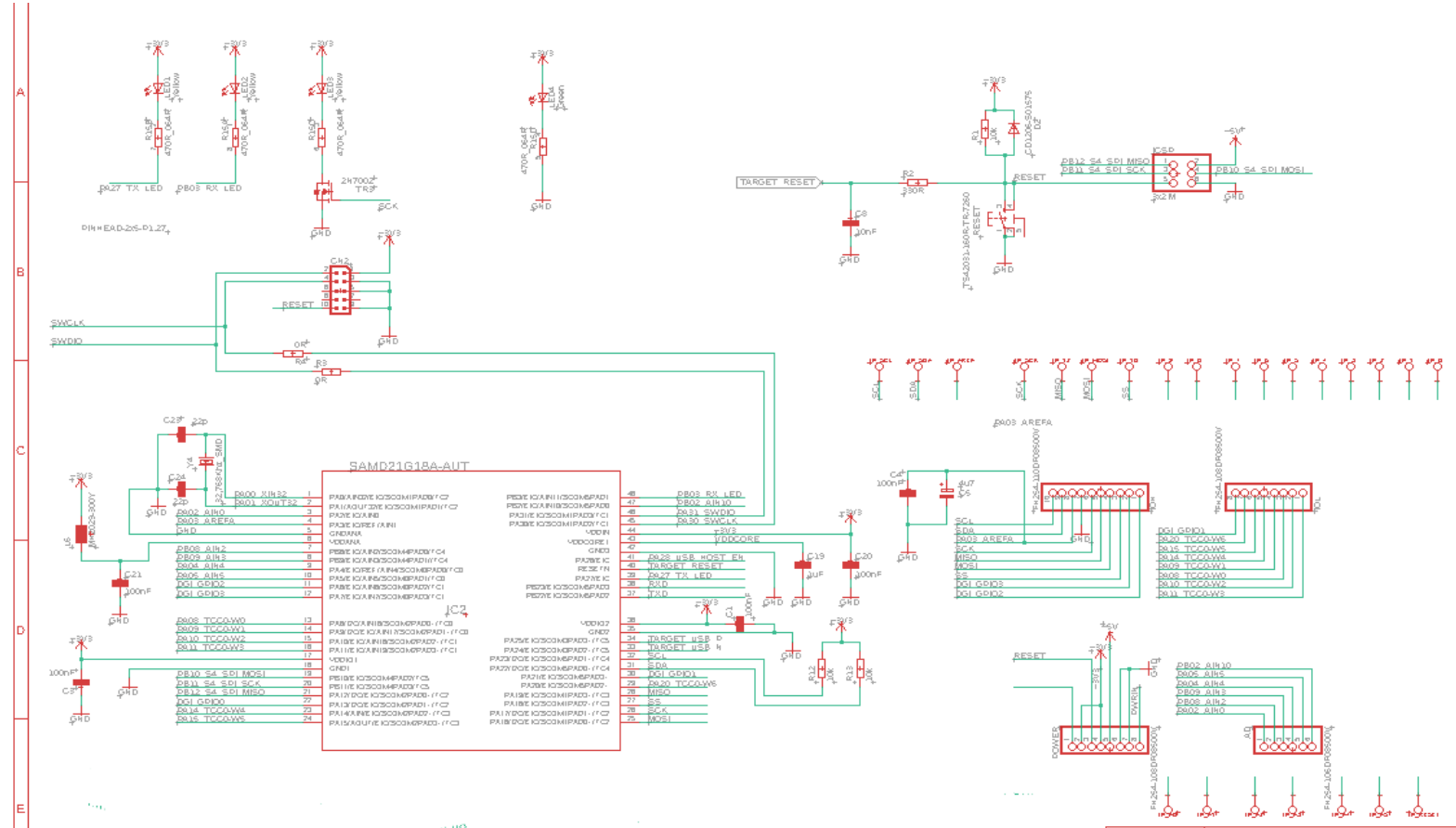
Raspberry Pi 4



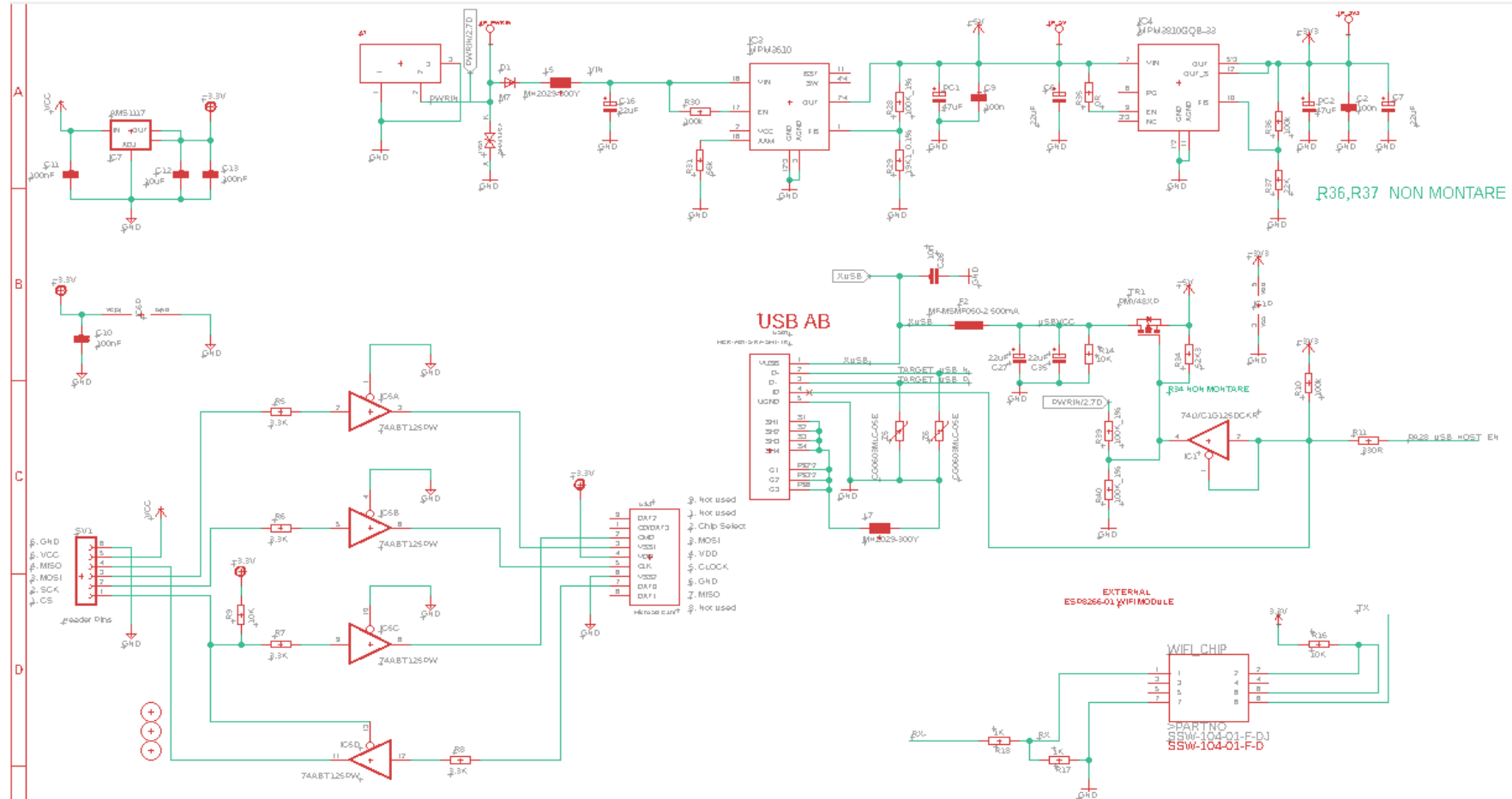
- Advantages:
- Low cost (~ \$35)
- Huge power in a small a compact board
- Many ports connection (HDMI, USB, USC-C, etc.)
- Support many languages (C, Linux, python)
- Many libraries for programing



PCB Schematic layout sheet 1



PCB Schematic layout sheet 2



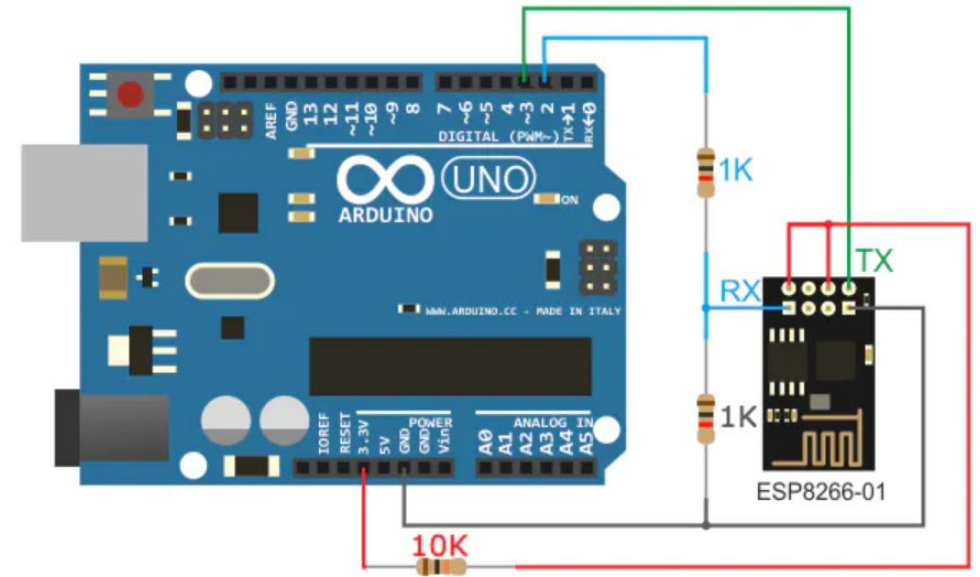
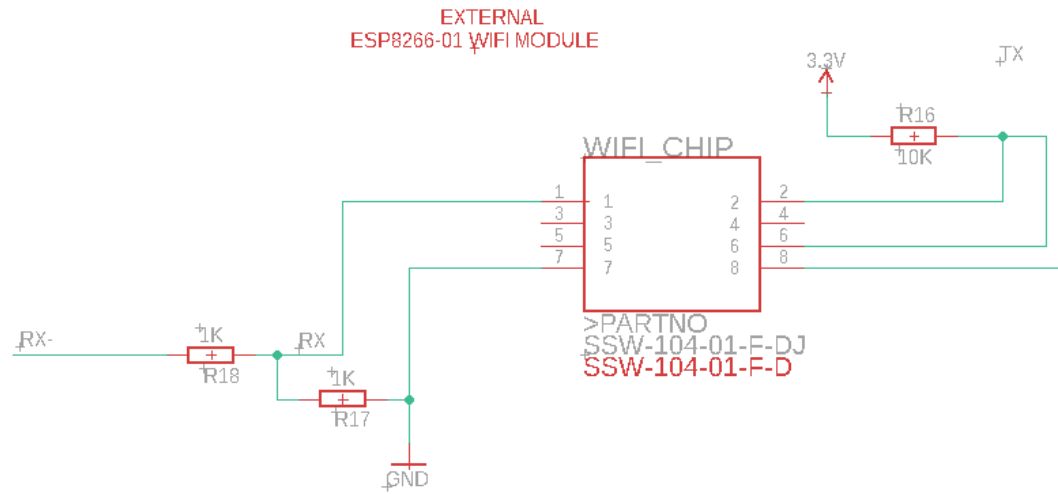
Microcontroller ATSAM21G18



- This Microcontroller will be placed on top of the PCB.
- Found on the Arduino M0.



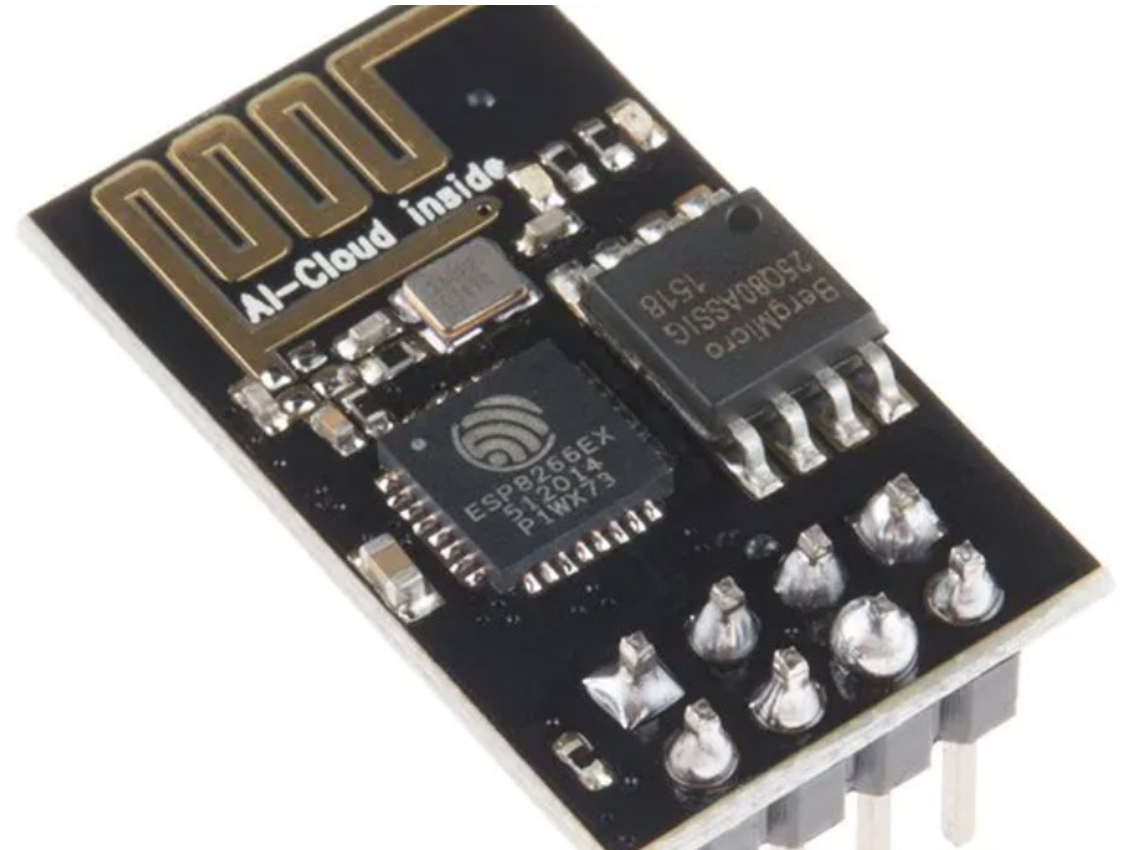
ESP8266-01 WiFi



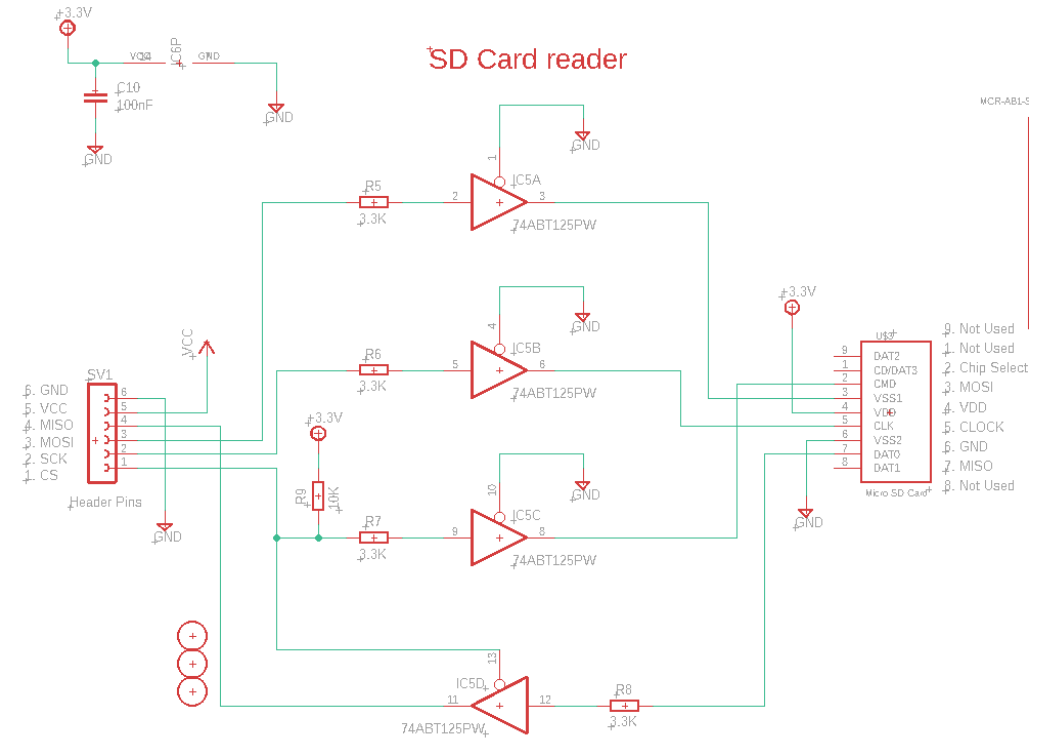
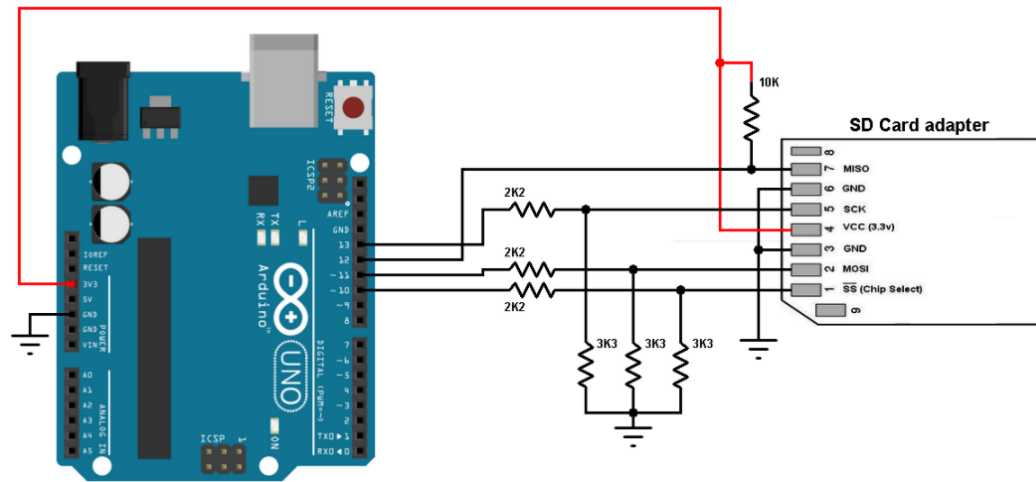
ESP8266-01 WiFi chip



- Cost is only \$3.50
- Solid online community
- Easy to use with the Arduino

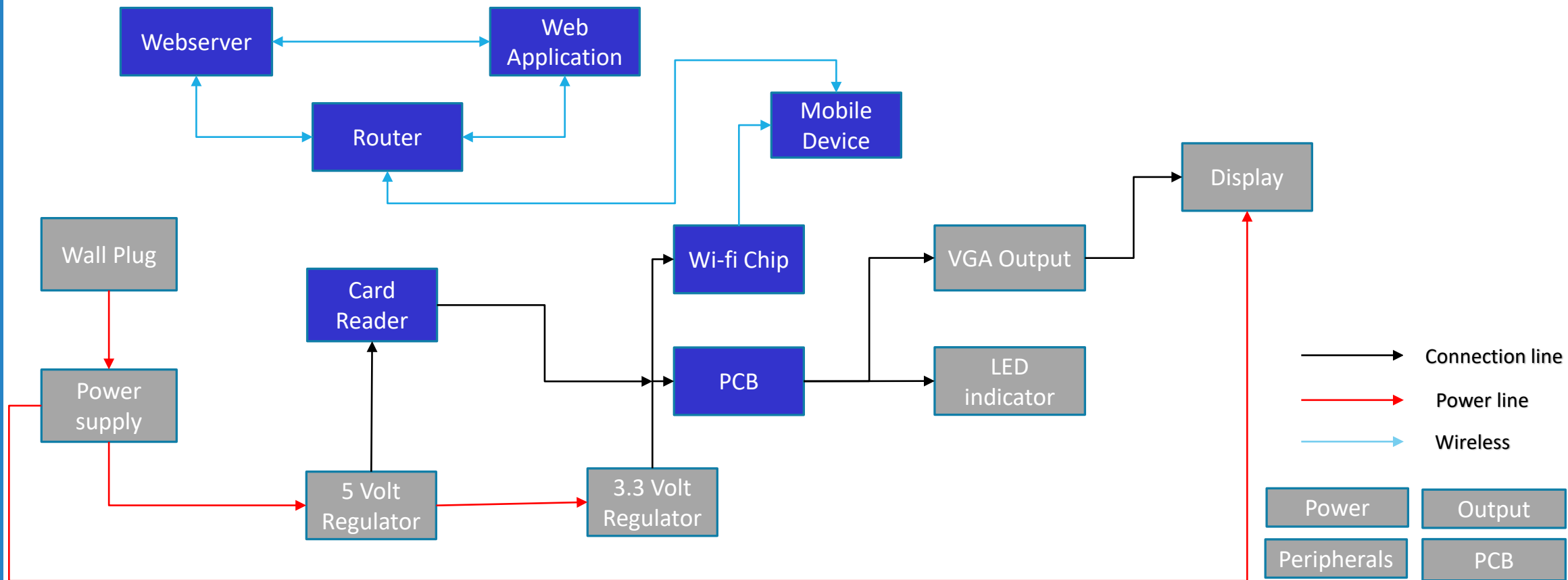


SD Card Reader Hblder





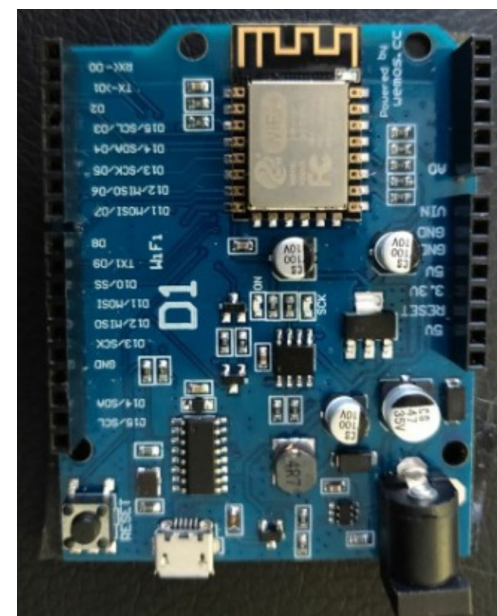
System Communication





Writing to SD Card with ESP 8266

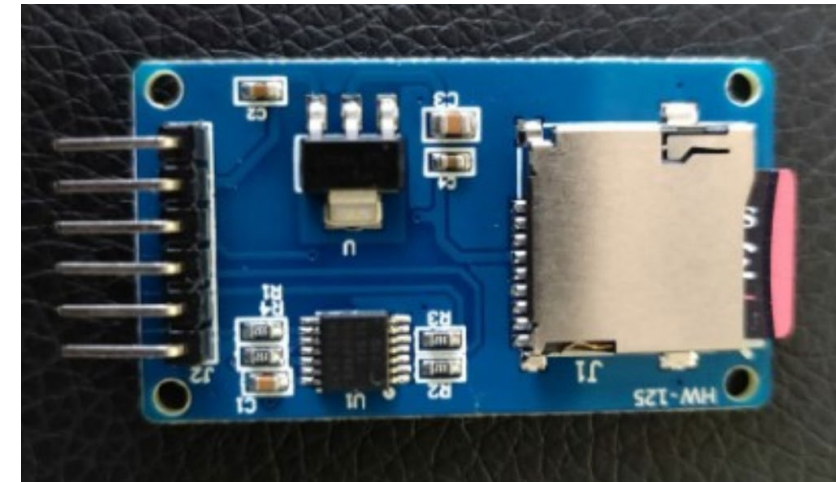
- Testing module used for the protocol.
- Serial communication
- Wiring through the SD Card using Wi-Fi module.
- Data will be stored in the SD card
- Microcontroller will read from the SD card



Reading from the SD Card



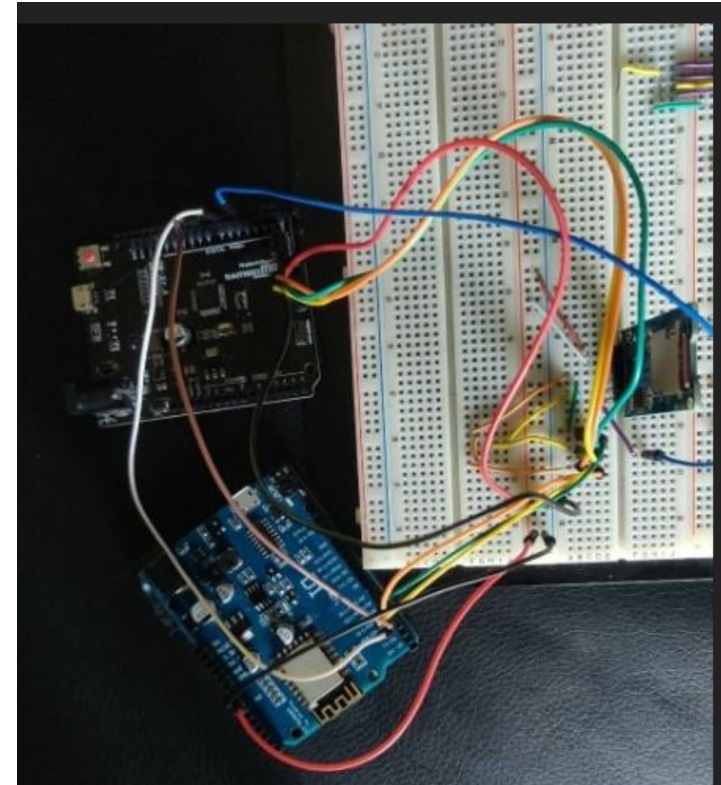
- ESP Indirectly writes to SD Card
- Data stored in the SD Card
- Microcontroller will read from the card
- Connection details stored on SD Card
- Contents will display from SD card each power on



Main System

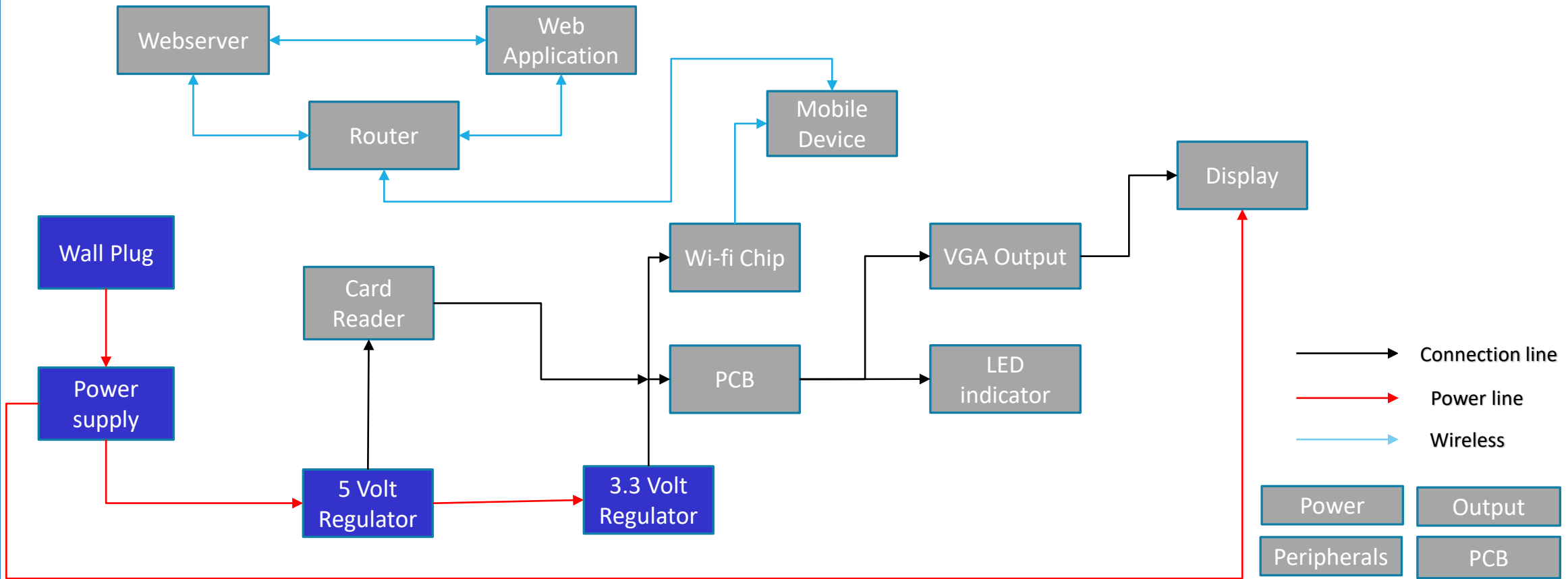


- Information stored on the SD card passes to Arduino
- Arduino passes info to Raspberry Pi
- Raspberry Pi displays image

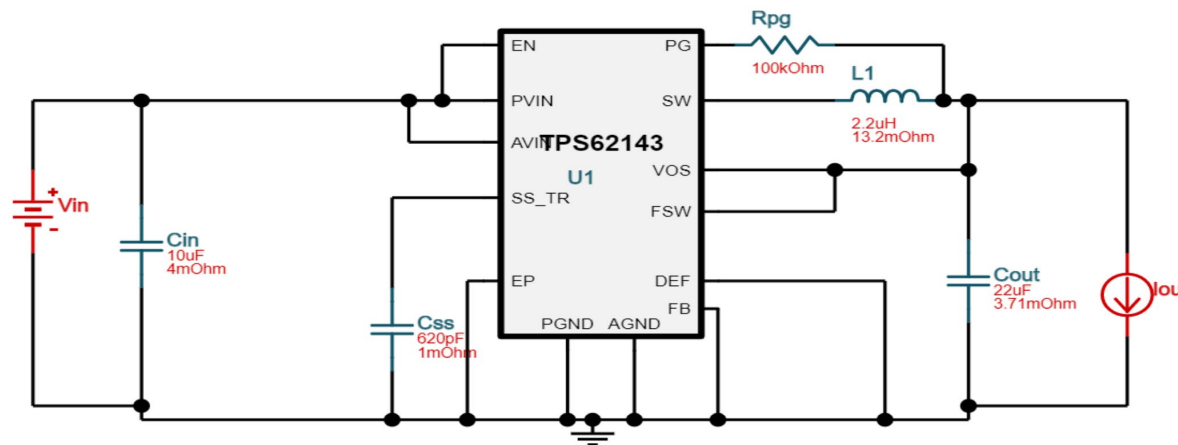
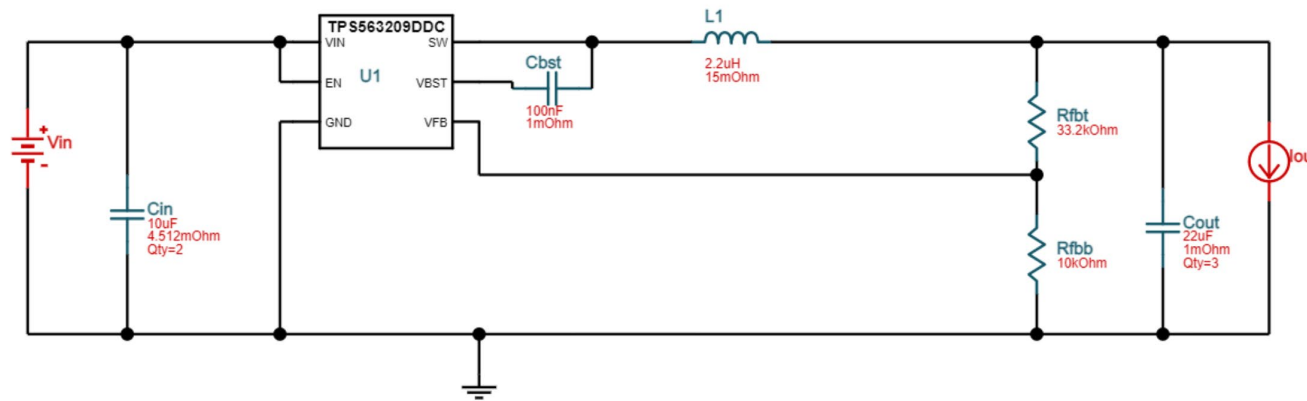
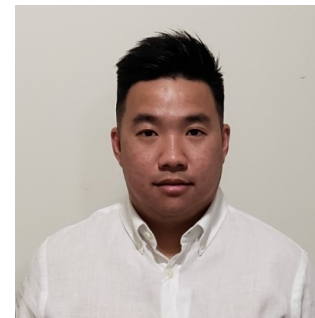




Power



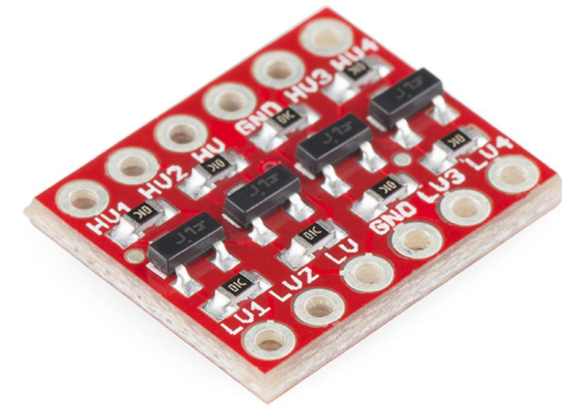
Power Supply Circuits



Bi-directional Level Shifter

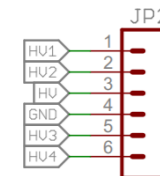
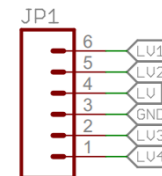


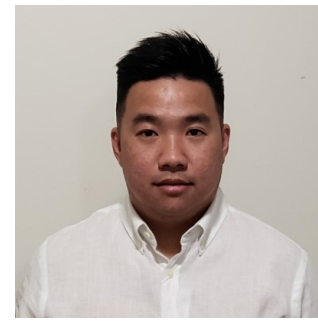
- Step up and down between 3.3V and 5V
- Step up and down in the same channel
- Using 4 pins on both side



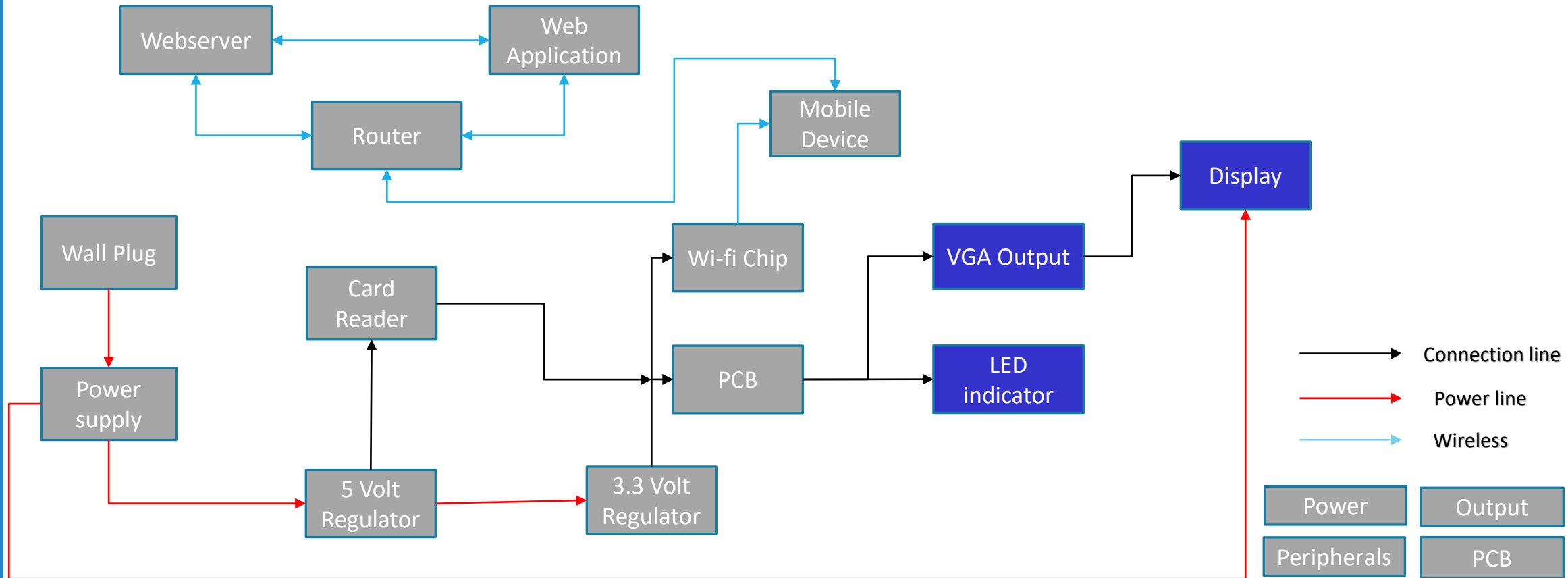
Low Voltage

High Voltage

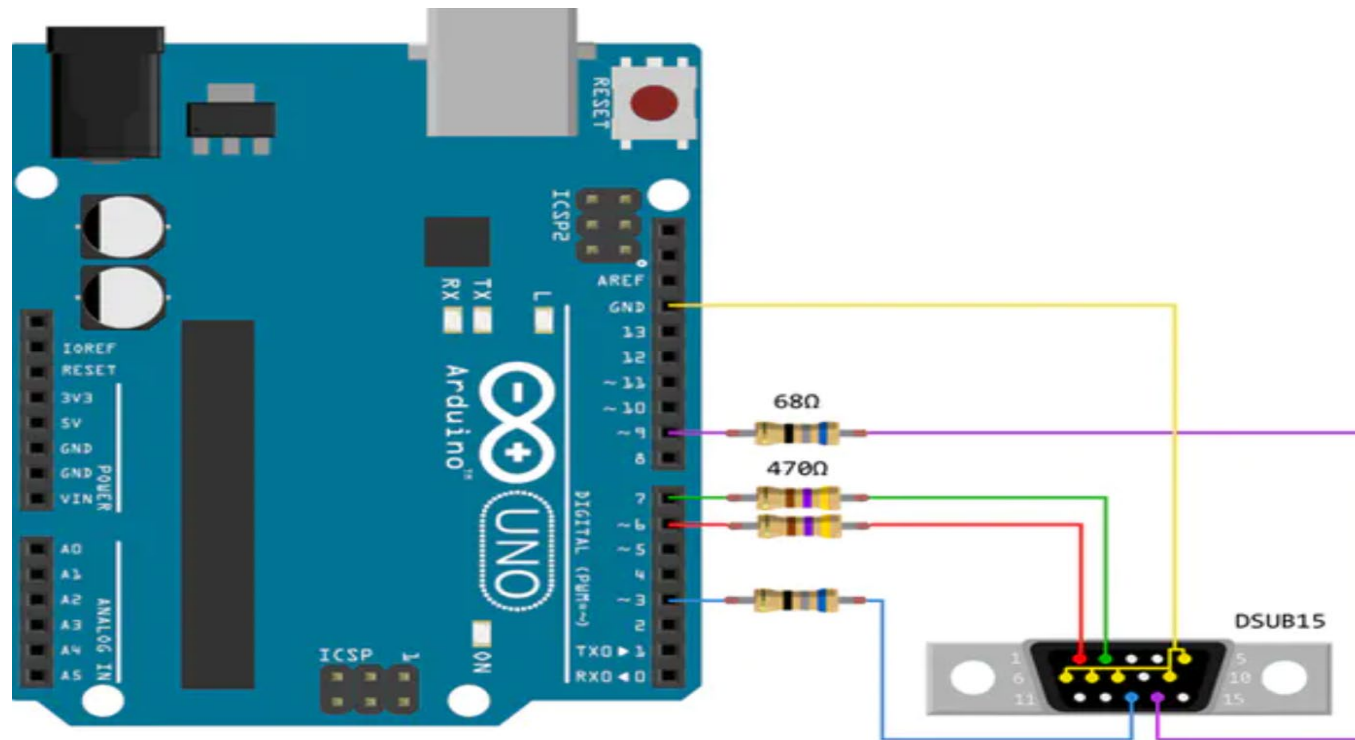




Displaying Data on Screen



VGA Connection



Pros:

- Low budget
- Simpler connection

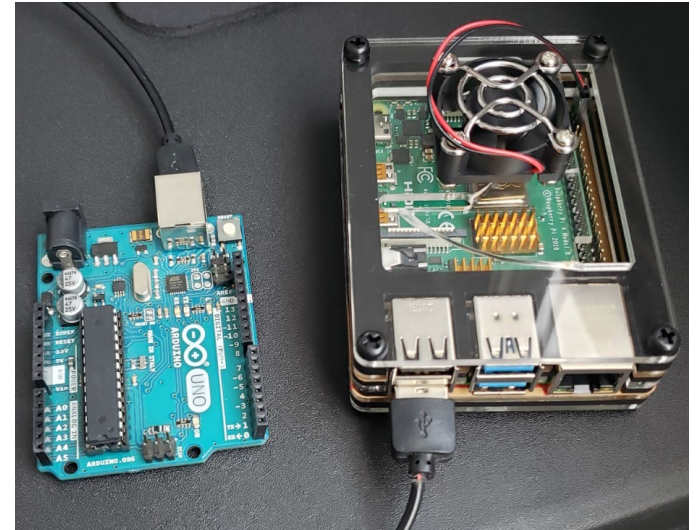
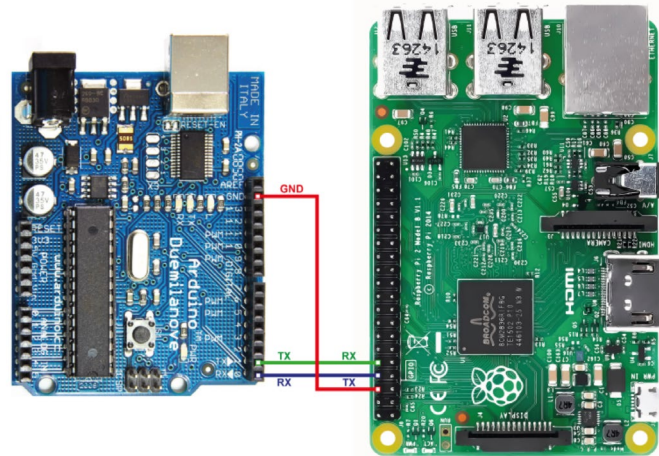
Cons:

- Not enough memory
- Low resolution

Arduino to Raspberry Pi

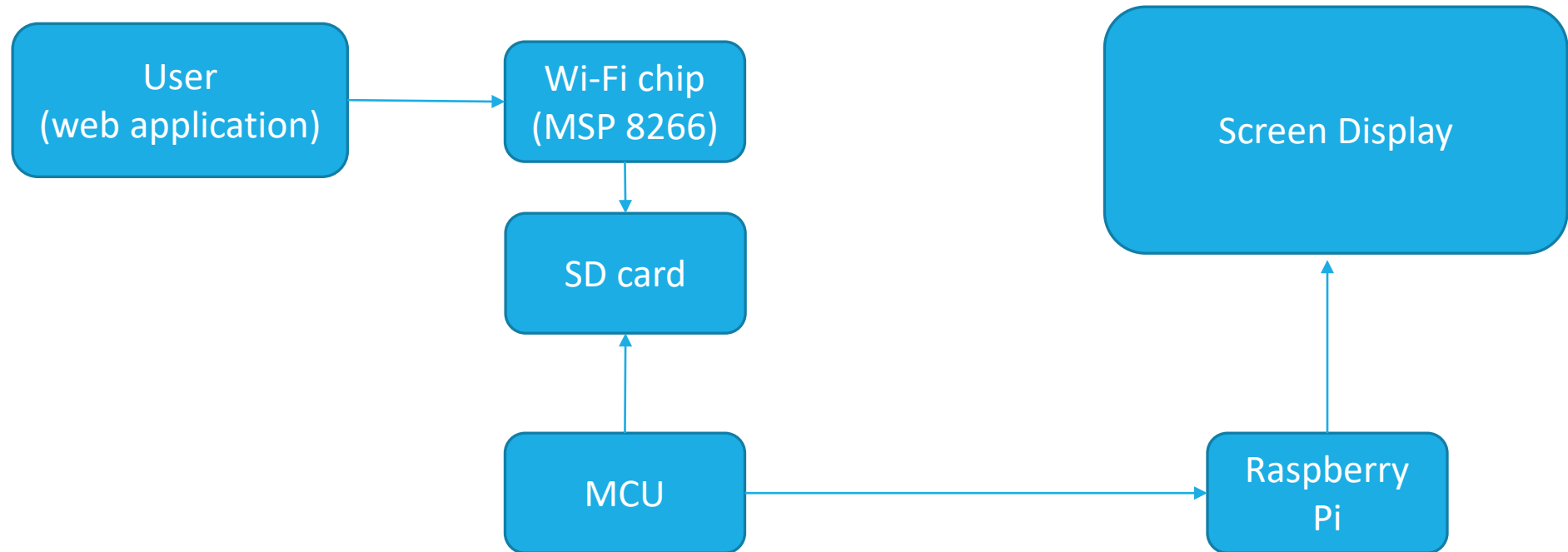


- Serial communication
- 2 common ways of connection
- Level shifter (3.3V to 5V)





How does information display on the screen?



Screen Display using HDM



- Auto display calendar application
- Auto sync data
- Application using python



Constraints and Restrictions



- Budget of \$400
- Easy to use App
- Receiving online purchases Delay(COVID-19)
- Meeting with group members (COVID-19)

Budget



Items	Quantity	Price
Monitor	3	\$ -
PCB	1	\$ 100.00
Ardrino	1	\$ -
Raspberry Pi	1	\$ 50.00
Parts to attach to PCB	-	\$ 90.00
Protype parts	-	\$ 25.00
Box to cover product	1	\$ 30.00
Total Price		\$ 295.00

Progress



Percent Complete

