1. ⚡ Power supply zone

This zone takes 5V from the USB-C connector and converts it into a stable 3.3V supply that powers the entire board.

J1 (USB4515...): USB-C Connector. This is the main power input for the board (receives +5V).

R1, R2 (5.1k): CC Resistors. These are required by the USB-C specification. They signal to the power source (like a charger) that the board requests 5V.

U1 (AP2112K...): LDO Regulator. This is the most important component in the zone. It "steps down" the 5V input to a stable +3.3V output, which will power all the MCUs and modules.

C1 (10uF): Input Filter Capacitor. It stabilizes the 5V input before it enters the U1 regulator, removing noise.

C2 (10uF): Output Filter Capacitor. It stabilizes the 3.3V output after the regulator, ensuring a clean power supply for the rest of the board.

R3 (1k), D1 (LED): Power Indicator. A simple LED circuit that lights up when the +3.3V power rail is active.

2. 💻 Programing zone

This zone allows a single ST-Link programmer to select and program one of the five connected microcontrollers.

P1 (TSM-105...): ST-Link Connector. This is the 10-pin header where you'll plug in your ST-Link V2 programmer. It's the "input" for the SWD signals (SWDIO, SWCLK, NRST).

U2, U3, U4 (CD74HC4051): Analog Multiplexers (MUXs). These are the "brains" of the zone. They act as signal switches:

U2 switches the SWDIO signal.

U3 switches the SWCLK signal.

U4 switches the NRST (Reset) signal.

SW1 (A6SN-3101): DIP Switch. This is your manual control. You use it to set a 3-bit address (e.g., 001), and the MUXs route the ST-Link signals to the corresponding MCU (e.g., MCU 2).

R4, R5, R6 (10k): Pull-down Resistors. They ensure the control lines (S0, S1, S2) have a stable 0 (GND) state when the SW1 switch is in the OFF (open) position, preventing a "floating" state.

3. 🔌 Connection zone

This is simply the set of physical connectors where your external MCU modules (like Nucleo boards) will be attached.

MCU1 ... MCU5: MCU Headers. Five 5-pin headers. Each header receives:

Its unique SWDIO, SWCLK, and NRST signals from the "Programing zone" MUXs.

+3.3V and GND power from the "Power supply zone".

4. 📶 Wifi zone (Communication Zone)

This zone prepares two separate modules (WiFi and USB-UART) that you can then connect to any MCU using jumper wires.

J2 (1981568-1): Micro USB Connector. This is used only to power the U6 (CP2102N) chip and provide it with a USB signal from your computer.

U6 (CP2102N): USB-UART Bridge. This chip converts the USB signals from J2 into simple TXD/RXD (UART) signals that an MCU can understand.

R7 (10k), C3 (100nF): Basic components for U6 (a pull-up resistor for its RST pin and a power filtering capacitor).

U5 (ESP-12F): WiFi Module. This provides the WiFi functionality.

R8 - R12 (10k): Bootstrapping Resistors. These are critically important for the ESP-12F. They set the logic levels of the EN, RST, GPIO0, GPIO2, and GPIO15 pins during startup, telling the module to boot into its normal operating mode.

C4 (1uF): Power filtering capacitor for the ESP-12F.

P2, P4: Communication Output Headers.

P2 provides the TX/RX signals from the ESP-12F (WiFi).

P4 provides the TX/RX signals from the CP2102N (USB-UART).