# APPLE 32

A STM32F103VET6 implemented Apple I
emulator with Local AI and WiFi support

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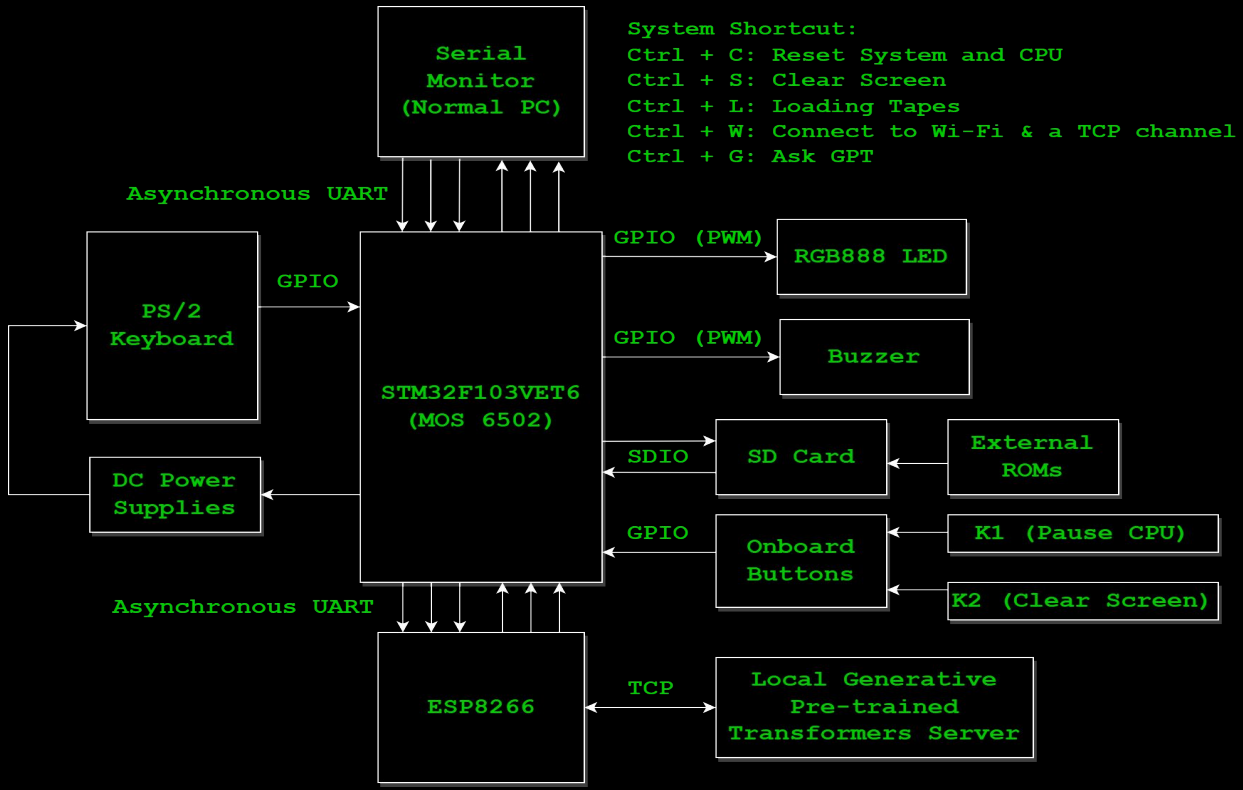
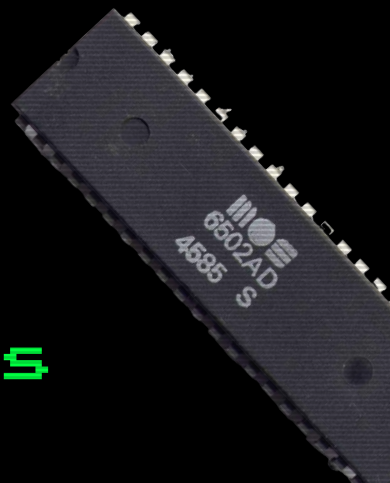


# MOS 6502 CPU

- 8-Bits CPU
- Launched 1975; 48 years ago...
- Used in many retro devices
  - GBA, APPLE I, C64 etc...
- 151 Opcodes in total
- Very few registers
  - Accumulator
  - X index, Y index
  - Stack Pointer
  - Program Counter, CPU Flags



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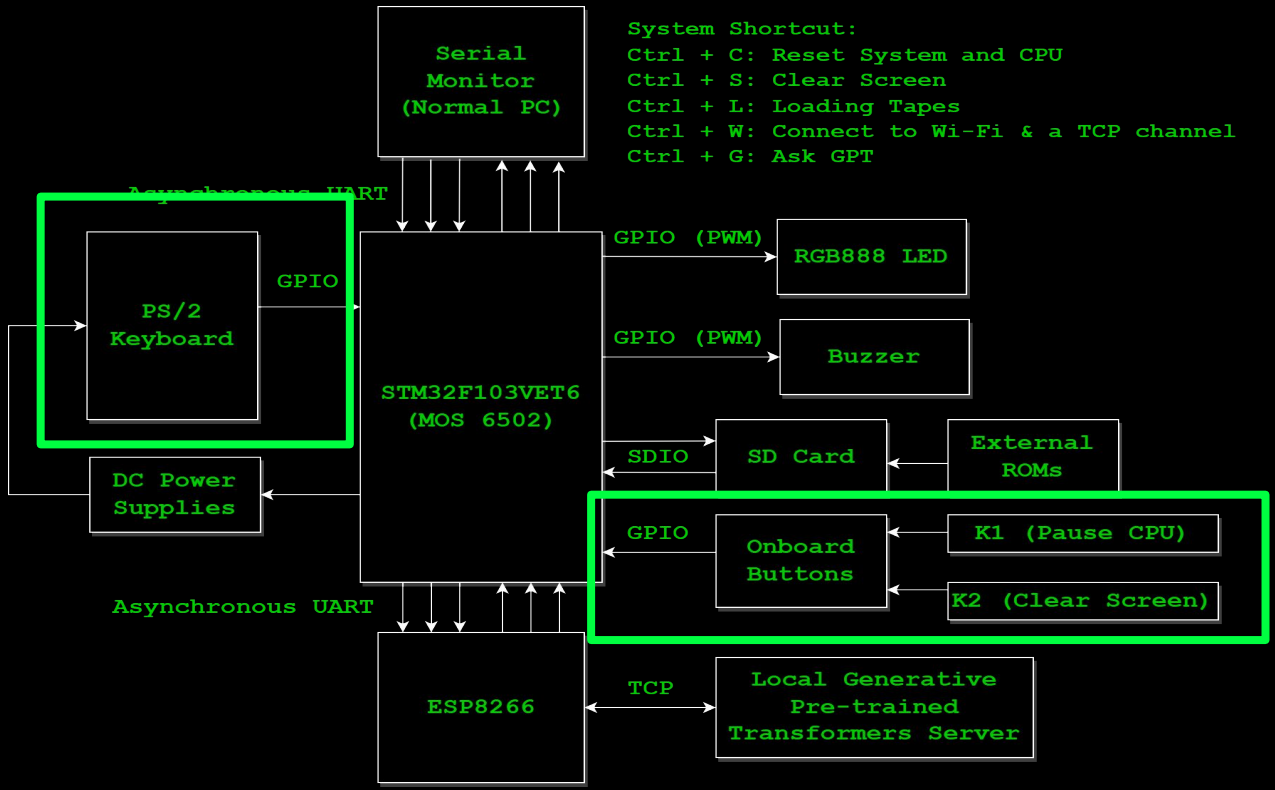
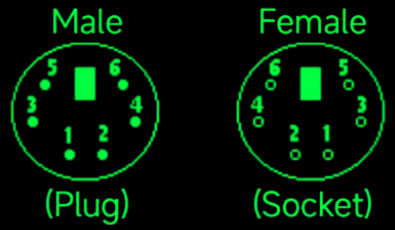


# INPUT KEYBOARD

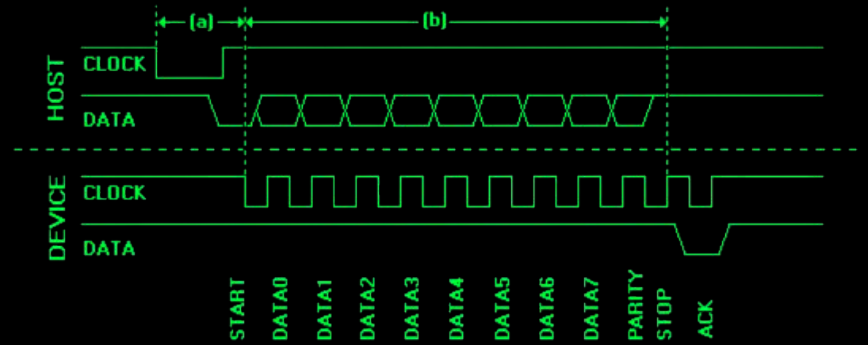
## # PS/2 Keyboard

> LOWERING EDGE INTERRUPT SERVICE
> $ 2 GPIO INPUT PINS (CLK&DAT)
> $ READ 11 BITS & GET ASCII WITH MAP
> $ STORE IN BUFFER FOR POLL ACCESS




**6-pin Mini-DIN (PS/2):**

1 - Data
2 - Not Implemented
3 - Ground
4 - Vcc (+5V)
5 - Clock
6 - Not Implemented



# INPUT KEYS

# ONBOARD KEYS (GPIO)

> USE INTERRUPT SERVICE

$ K1: PAUSE CPU
DROP INTO INF LOOP (HALT)

$ K2: CLEAR SCREEN
BOTH UART MONITOR & LCD

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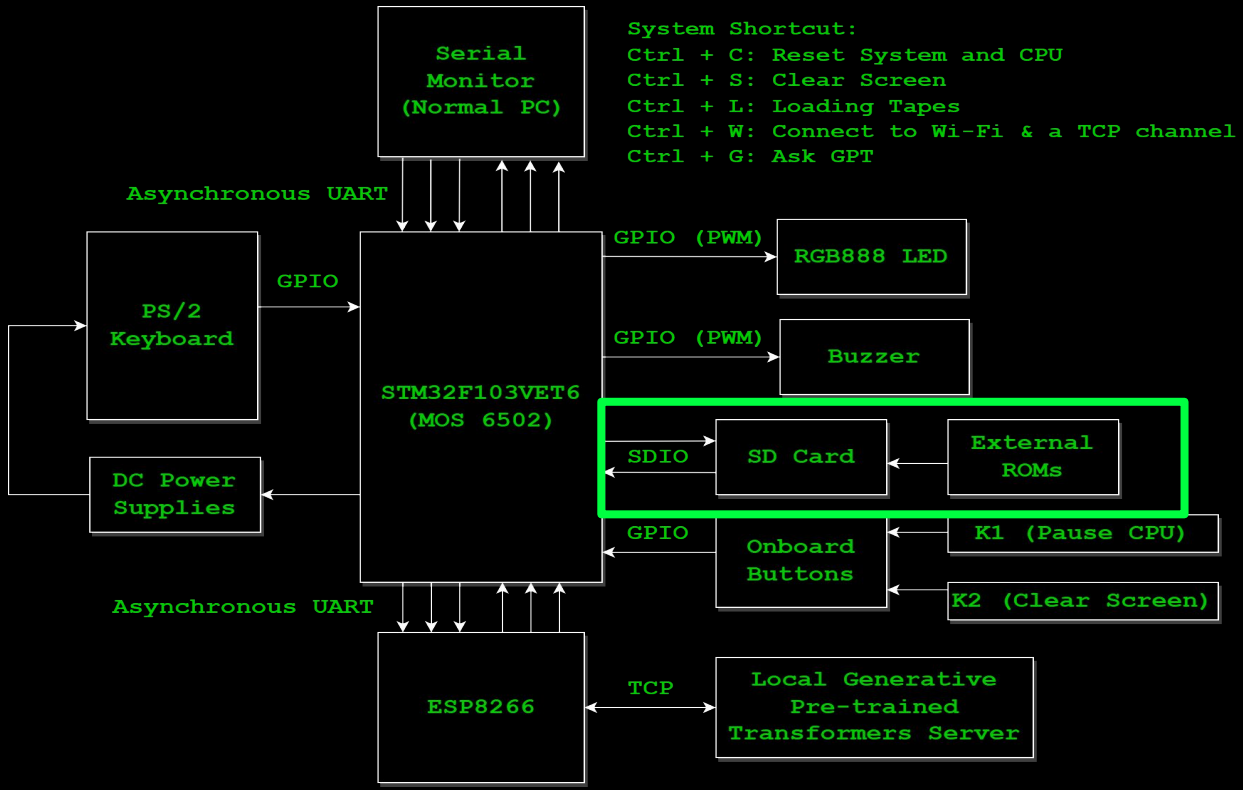
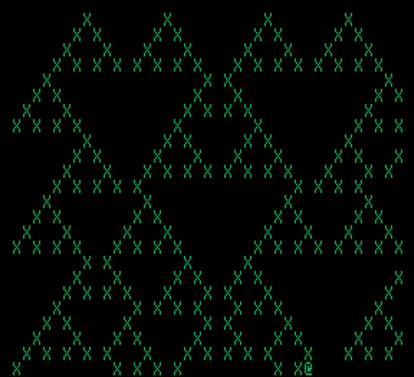
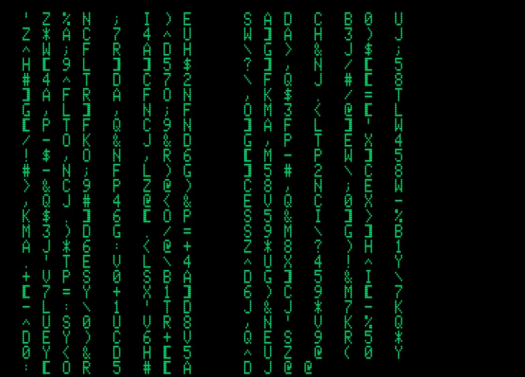


# TAPE EMULATION

# SDIO CONNECTED TO STM32
> 128MiB SD CARD
$ Use FATFS LIBRARY
$ Include Apple I program & games



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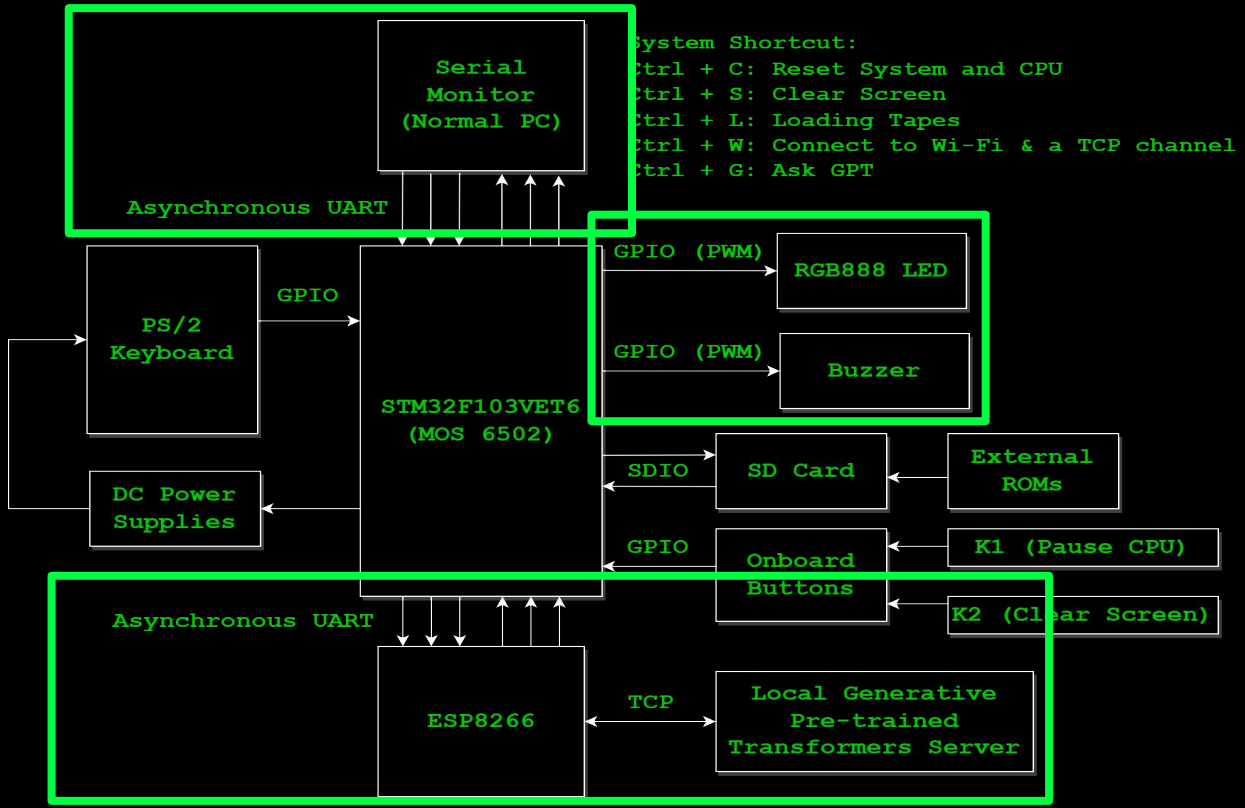

# PWM OUTPUT

## ON-BOARD RGB LED

> PWM TIMER 3 CONTROL
> Normal State: Ambient Light
> Loading File: Stop Cycling RGB
> CPU/LCD Busy: Cycle Blinking

## ON-BOARD BUZZER

> PWM TIMER 1 CONTROL
> Max 1000Hz; CLOCK: 72 Mhz
> Prescaler: 71; ARR: 999

# LCD OUTPUT

## # ON-BOARD LCD

> Rotated display direction

> Changed FONT -> 10x06 ASCII
  $ Original APPLE I is  40x24 Chars

> Set default as 0x0000 (Black)

> Act as a serial terminal
  $ Can't delete/backspace
  $ Only rub out chars using "_"

# ASYNC UART

# UART 1 -> PC Serial Terminal
> Debug & External Display
> Baud Rate: 115200

# UART 3 -> ESP8266 WiFi
> Connect to Local GPT Server
> Client Mode
> TCP Transparent Transmission
> Baud Rate: 115200

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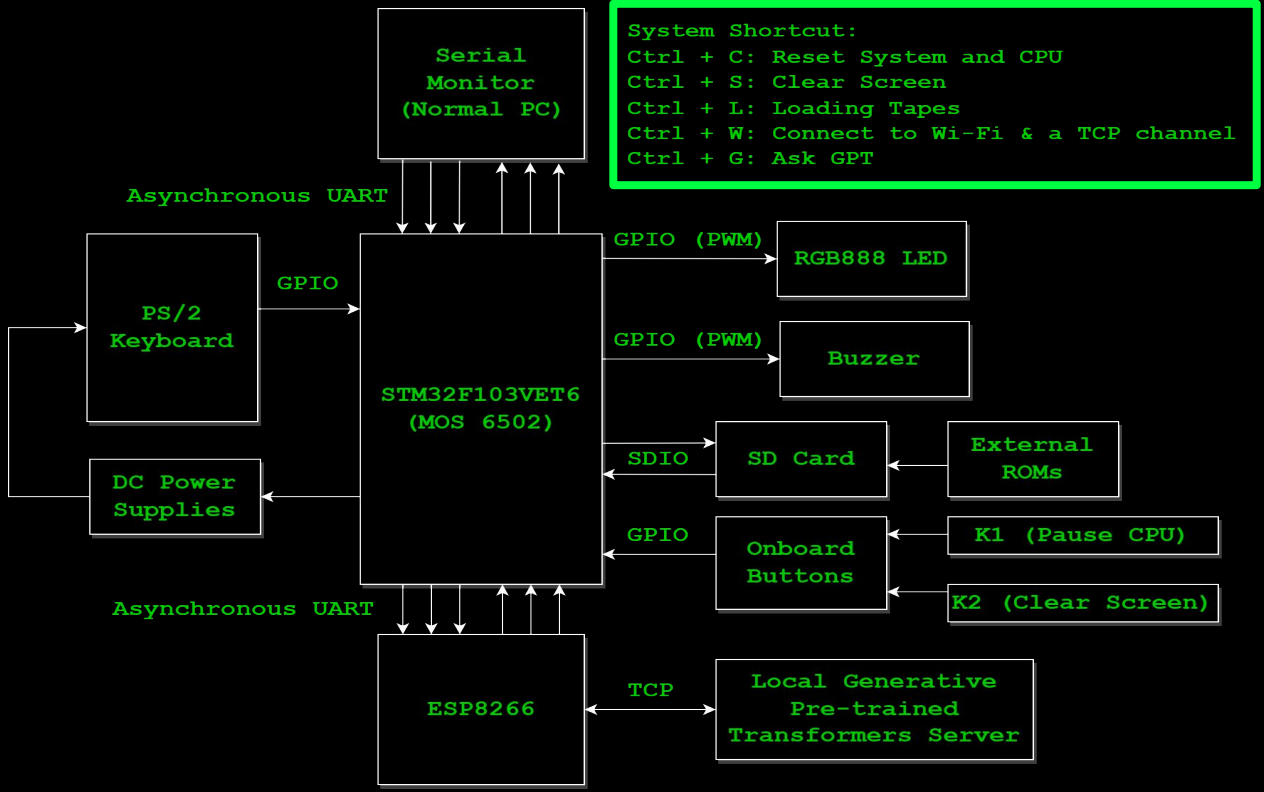

# First PC + AI

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> WHAT DO YOU THINK ABOUT THIS PROJECT?

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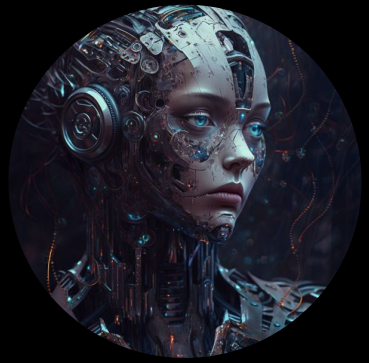
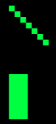
APPLE I:
I FEEL EXCITED ABOUT THE FUTURE.
I WANT TO SAY...

# “HELLO WORLD
# OR
# SHOULD I SAY”



## “ HELLO HUMAN 🤖 ”



# TH4NK YOU