NES Programming

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Graphical Capabilities/Limitations

- **Screen**
  - 256x240 Resolution
  - Horizontal Scanlines (240)
Graphical Capabilities/Limitations

- **Sprites**
  - 8x8 and 8x16
    - 8x16 are two memory locations.
    - All sprites must be aligned to the same memory size, so 8x8 sprites take up a 8x16 position.
  - Max of 64 sprites on the screen at one time.
    - More causes flickering.
  - Max of 8 sprites per scanline.
Graphical Capabilities/Limitations

- Colors
  - 4 colors per sprite (technically 3, the fourth is transparent).
  - Store up to 48-color palettes.
  - Max of 50 colors total.
  - 25 colors max per scaline.
    - Note, each sprite can have up to 3 colors.
    - $8 \times 3 = 24$, which is the max-1.
Tools

- **Emulator**
  - fceu - Nintendo Emulator

- **Assembler**
  - xa - Don’t use this...
  - tasm - Don’t use this...
  - nesasm - Nintendo assembler.

- **Graphic Tools**
  - Palette Generator - Not really needed...
  - yy-chr - You will need this...
Programming

Let's program!
Using Programs on a Real Nintendo

- Inside a cartridge.
Using Programs on a Real Nintendo

- Unsolder these.
- Solder in sockets.
Using Programs on a Real Nintendo

- Change some of the traces.
Using Programs on a Real Nintendo

- Buy two AT49F002 chips.
Using Programs on a Real Nintendo

- Buy a universal EEPROM programmer.
Using Programs on a Real Nintendo

- Process *.nes file through ReadNES.
- Upload program data to one chip.
- Upload resources to other chip.
Questions?
Sources

- https://helloacm.com/tutorial-1-c-programming-for-6502-8-bit-cpu/
- http://www.cc65.org/doc/funcref-84.html
- http://skilldrick.github.io/easy6502/
- http://patater.com/gbaguy/nesasm.htm
- http://fms.komkon.org/EMUL8/NES.html
- http://callanbrown.com/index.php/basic-nes-reproduction
- http://www.kevinselwyn.com/ReadNES/