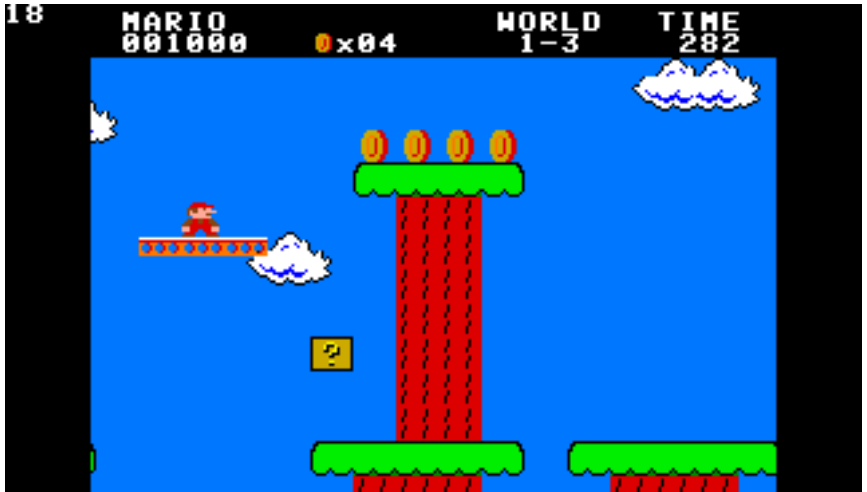

Generic
TILE
ENGINE

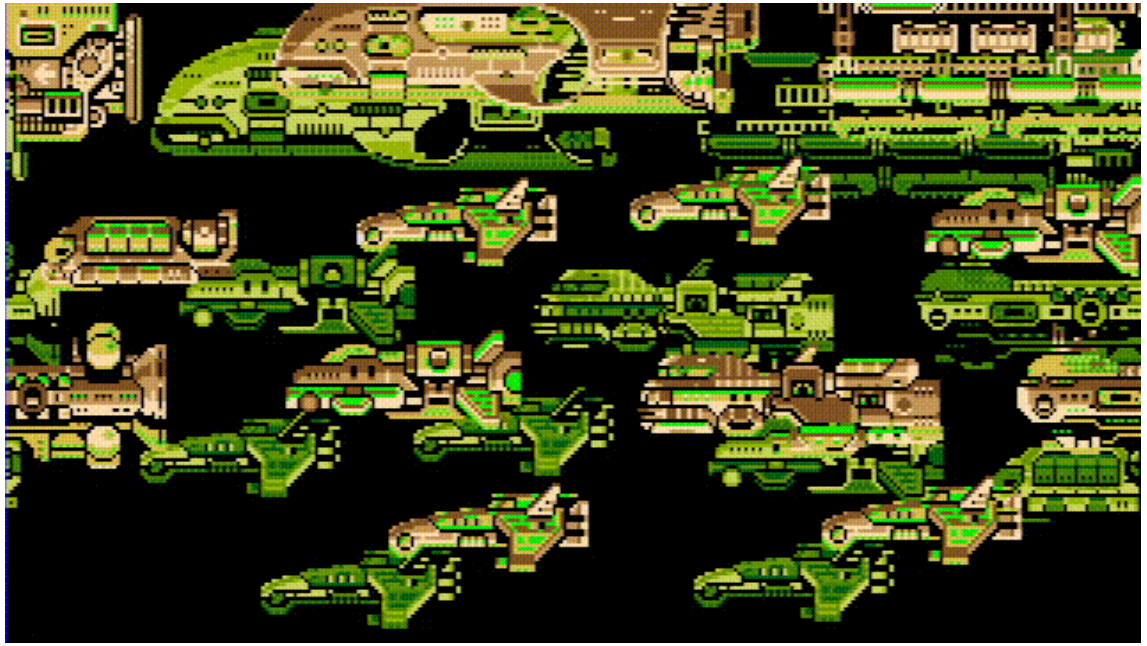
What is GTE?

- **G**eneric **T**ile **E**ngine
  - **Generic**: Useful for many types of games
  - **Tile**: Supports tile-based graphics inspired by 8/16-bit consoles
  - **Engine:** Vroom! Vroom!
- Project Page: https://github.com/lscharen/iigs-game-engine
- Documentation: https://lscharen.github.io/iigs-game-engine/toolboxref.html



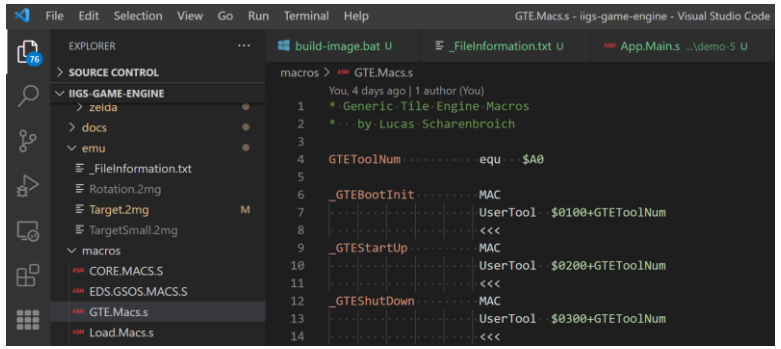
Goals

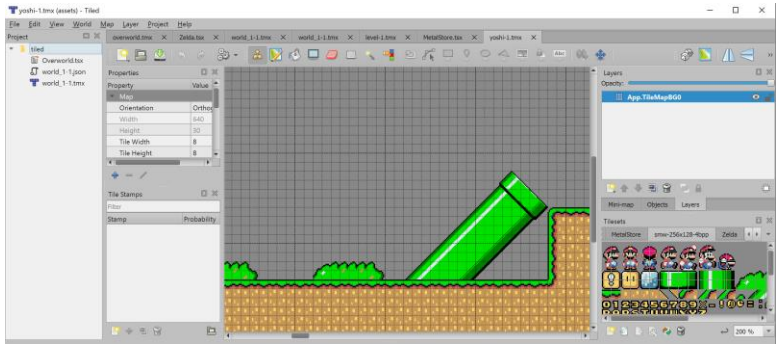
- **Flexible**
  - Minimal restrictions
- **Features**
  - Leverage the IIgs' quirks
  - A few clever techniques
- **Fast Enough**
  - Can't guarantee 30/60 fps
  - Easy to implement something fun

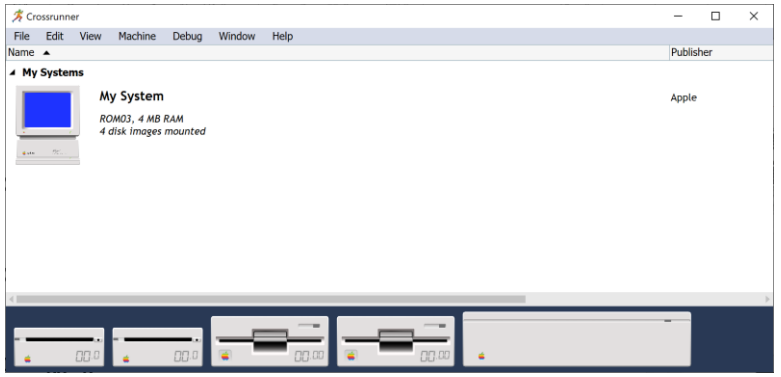


Preliminaries

- **Code**
  - All 65816 Assembly
  - VS Code + Merlin32 + Emulator
  - Toolbox
- **Content**
  - Tiled for map editing
  - Paint.Net for tilesets
  - Node.js scripts to build assets
- **Debugging**
  - Crossrunner
  - brk

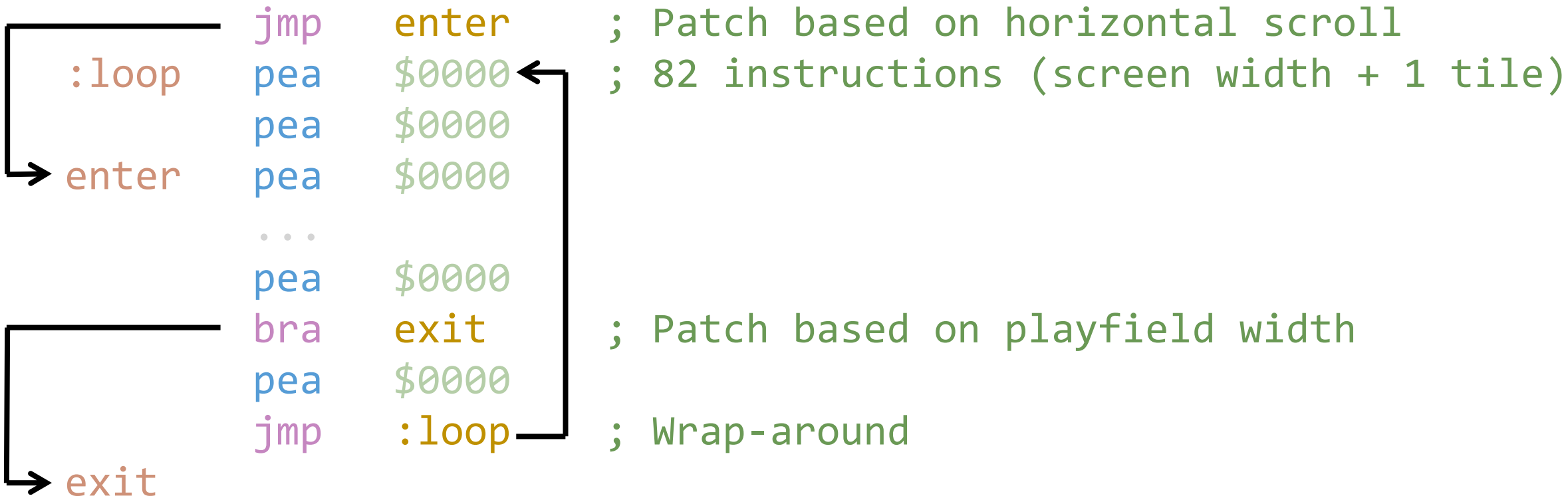




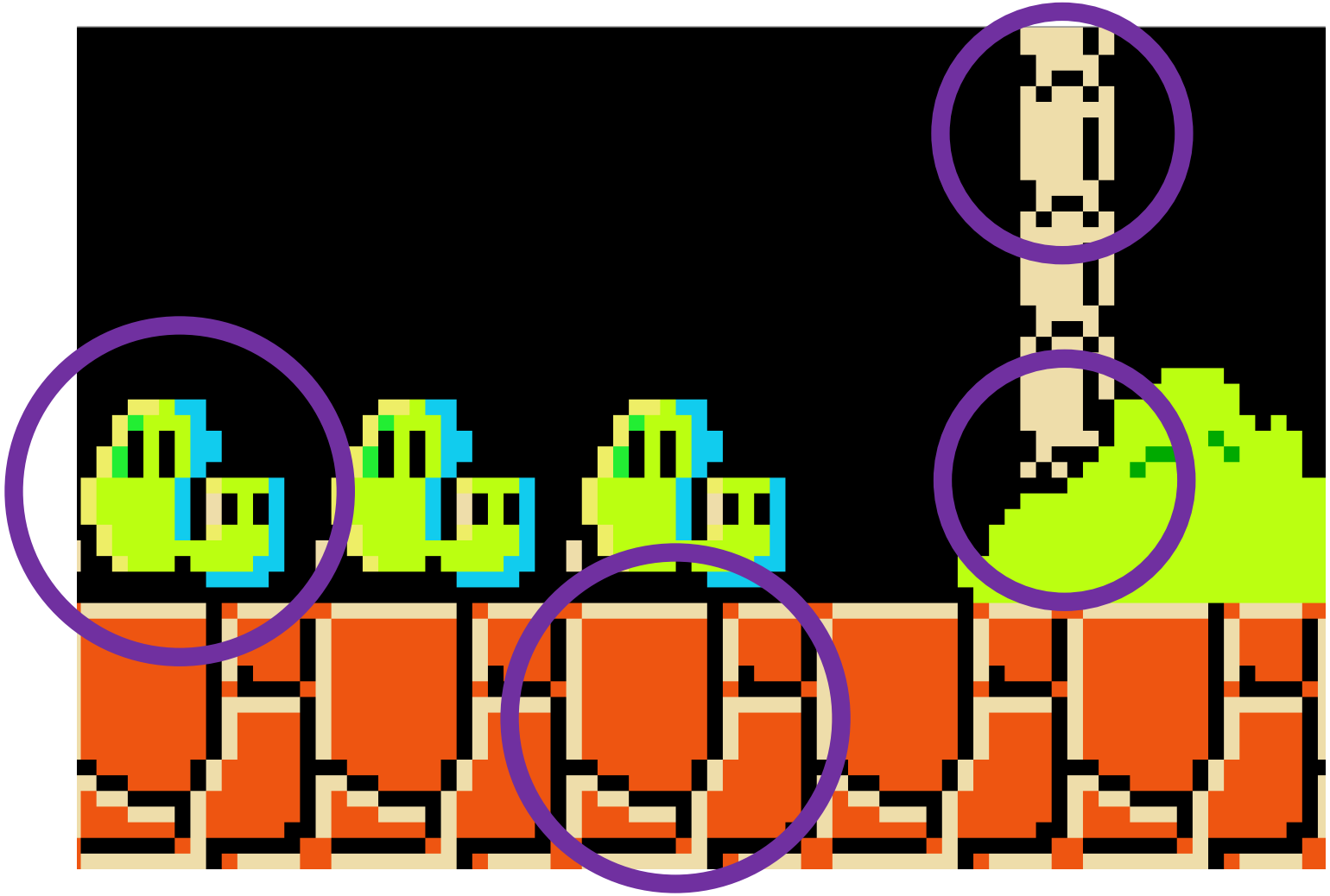


Backgrounds / Scrolling

- Maintain 208 lines of 82 3-byte instructions each
- 64kb per 16 lines (832kb!!)



Backgrounds / Scrolling



Dynamic Tiles

- Reads data from direct page
- Direct page set per line

```
            lda   #DP_ADDR ; Fixed per line
            tcd
            ...
            jmp   enter
:loop       pea   $0000
            lda   $00,x    ; Load data from direct page
            pha            ; and push onto stack
            ...
            pea   $0000
            jmp   :loop    ; Wrap-around
exit
```

Secondary Background

- Reads data from separate bank
- Y-register used to set secondary scroll position

```
        ldy   #ADDR     ; Patched when vertical origin changes
        ...
        jmp   enter
:loop   pea   $0000
        lda   ($00),y   ; Load data from data bank
        pha             ; and push onto stack
        ...
        pea   $0000
        jmp   :loop     ; Wrap-around
exit
```

Secondary Background Cont.

- What if the foreground does not have a full word of transparency?

```
        jmp   enter
:loop   pea   $0000
        jmp   snippet_00    ; Jump to the snippet handler...
        pea   $0000         ; ...and return here
        pea   $0000
        ...
        pea   $0000
```

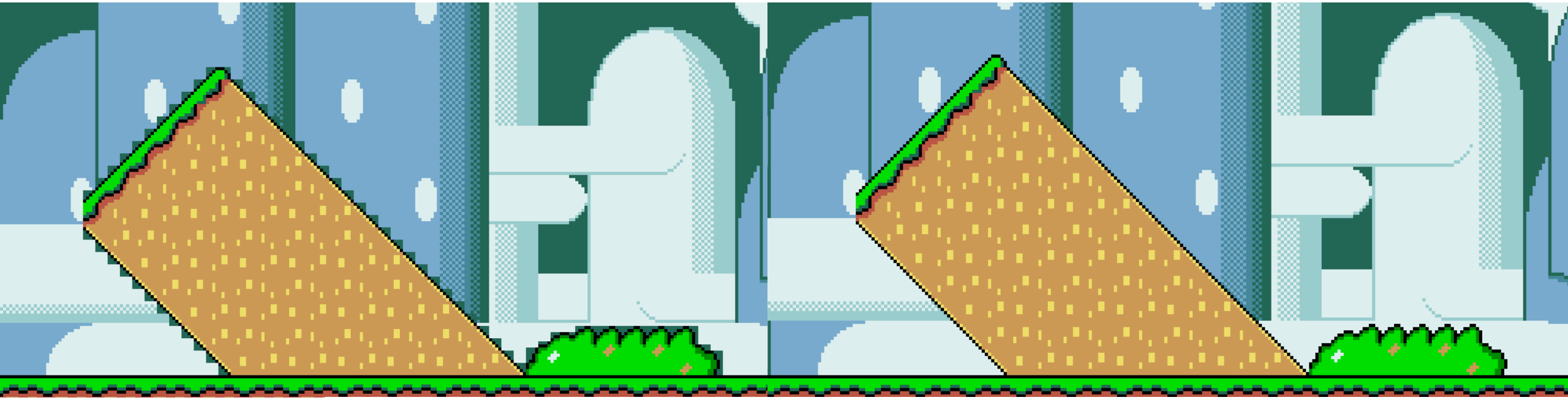
Secondary Background Cont.

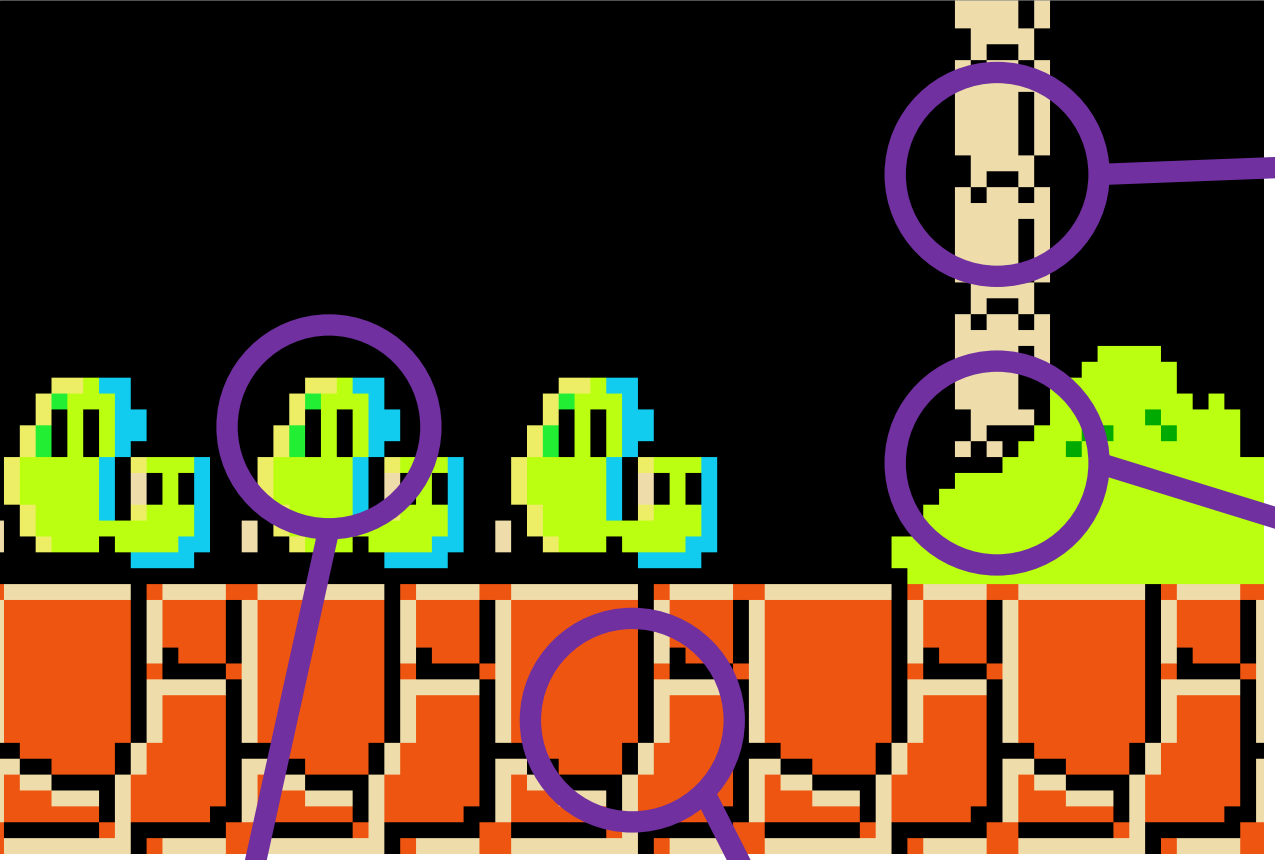
- What if the foreground does not have a full word of transparency?

```
snippet_00    lda   (00),y
              and   #MASK
              ora   #DATA
              pha
              jmp   rtn_00
```

Without Snippets

With Snippets





```
LDA (00),y
PHA
```

```
RTN_00: JMP SNP_00
RTN_01: ...
```

```
SNP_00: LDA (00),y
        AND #MASK
        ORA #DATA
        PHA
        JMP RTN_01
```

```
LDA 00,x
PHA
```

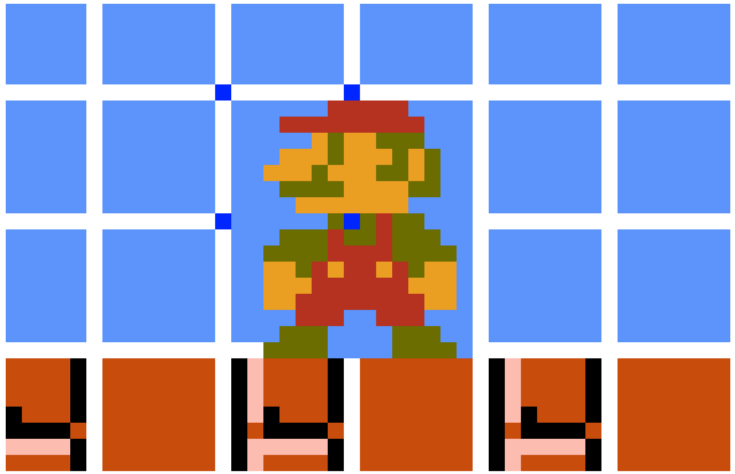
```
PEA #DATA
```

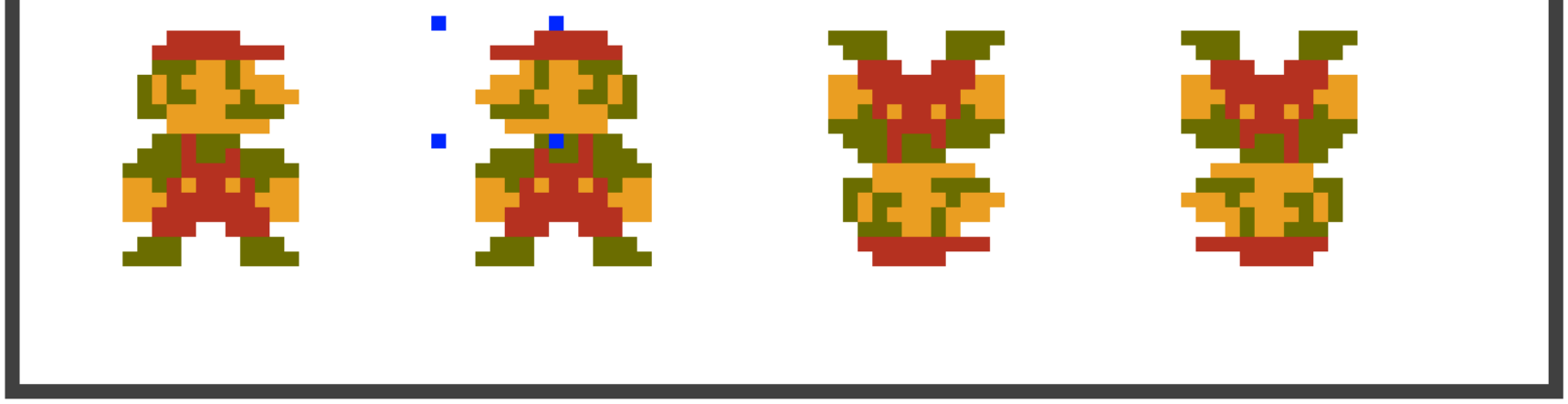
Dirty Tile Queue

Draw Tile

Blit

sprite stamp





Future Work

- Performance
  - Sparse Tile Copies
  - Fixed Snippets
  - Per-tile render mode selection
- Features
  - Dynamic V-Sync
  - Expand scripting subsystem
  - Sprite priority flag
  - Expand BG1 rotation range to >64KB
  - Internal size of 320x240 to align with consoles
  - Separate sprite tileset?
  - More sophisticated dynamic tile management?