EUROPE'S LEADING AEM DEVELOPER CONFERENCE

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Lightning Talk – 8-bit Breadboard Computer

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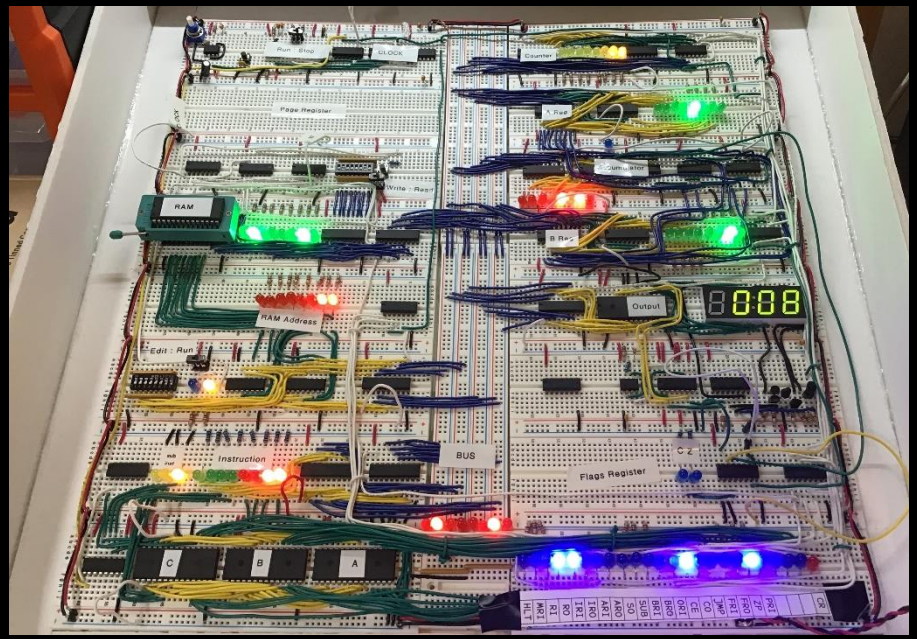
What is it?

adaptTo()

What is it?

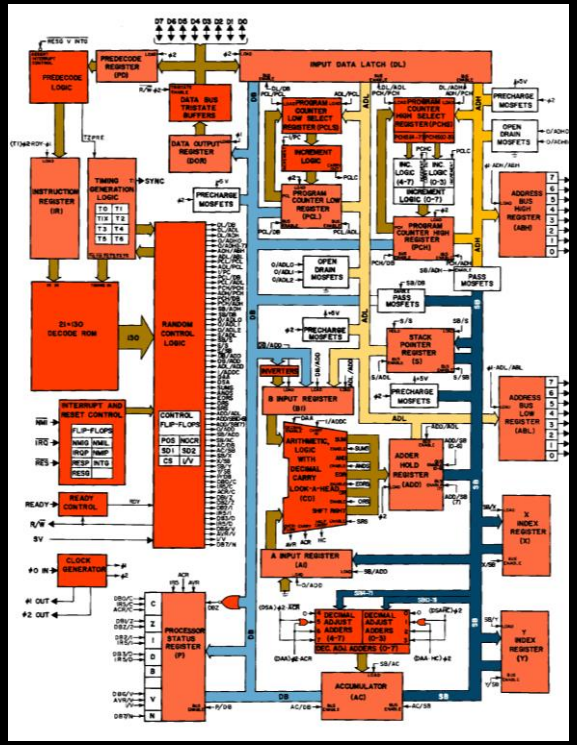


- Custom 8-bit computer
- Based on project by Ben Eater
- Work in progress!
- 6502, but simpler

What is it?

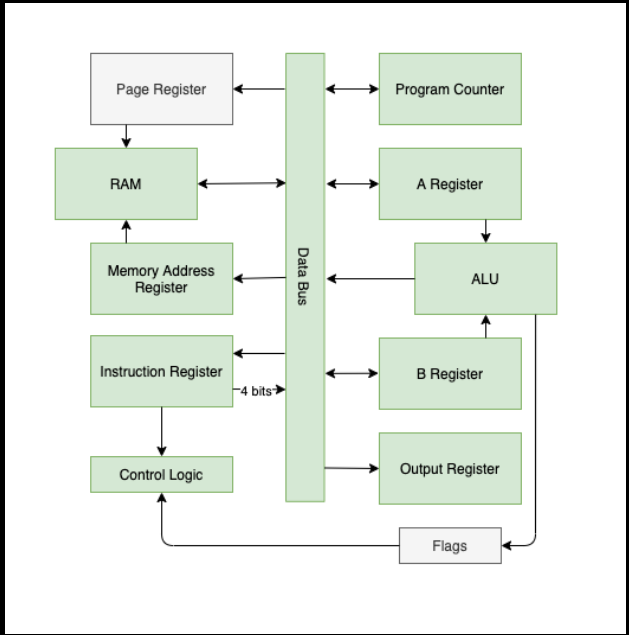
MUCH simpler!

6502



- 8-bit data bus
- 16-bit address bus
- 16-bit Program Counter
- 8 Bit Accumulator, X and Y
- 56 instructions, 8 addressing modes

Breadboard computer



- 8-bit bus
- 8-bit Program Counter
- 8-bit A & B Registers
- 9 instructions, 4 addressing modes

Instruction Set

	Addressing Mode							
	Implied (1)		Immediate (2)		Absolute ZP (2)		Absolute (3)	
JMP	0x0*	0000****	0xA0	10100000				
LDA	0x1*	0001****	0xB0	10110000	0xB4	10110100	0xB8	10111000
	0x2*z	0010****						
STA	0x3*z	0011****			0xC4	11000100	0xC8	11001000
ADD	0x4*	0100****	0xD0	11010000	0xD4	11010100	0xD8	11011000
	0x5*z	0101****						
SUB	0x6*	0110****	0xE0	11100000	0xE4	1110100	0xE8	11101000
	0x7*z	0111****						
TAO	0x80	10000000						
BEQ	0x9*	1001****	0xA4	10100100				
BCS	0xA*	1010****	0xA8	10101000				
HLT	0xF0	11110000						

**** indicates low nibble interpreted as a value

Z indicates “implied zero page” where RAM is a 4-bit address 0-16

Why?

Why?

- Understand how processors work
- Get away from screen
- Who doesn’t love blinkenlights?

Simple Program

- Super simple program – multiples of 2

```
00  10              LDA #0   ; load 0 into accumulator
01  40              ADD #0   ; add 0 - clears B reg
02  80              TAO      ; clear output
03          loop:
03  42              ADD #2   ; add 2
04  80              TAO
05  03              JMP loop ; jump back to loop
```

DEMO TIME!

adaptTo()

Steps in processing an op-code

- Instructions have variable cycle counts
- Example: ADD #2 (42) – 3 cycles

Cycle	Operations
0	Counter Out, Memory Reg In
1	Zero Page, RAM Out, Instruction Reg In, Counter Enable
2	Instruction Reg Out, B Reg In
3	Sum Out, A Reg In
4	Cycle reset (transient)

References

- Me: https://www.martinnoble.com
- Ben Eater: https://eater.net/
- Visual 6502: http://www.visual6502.org/