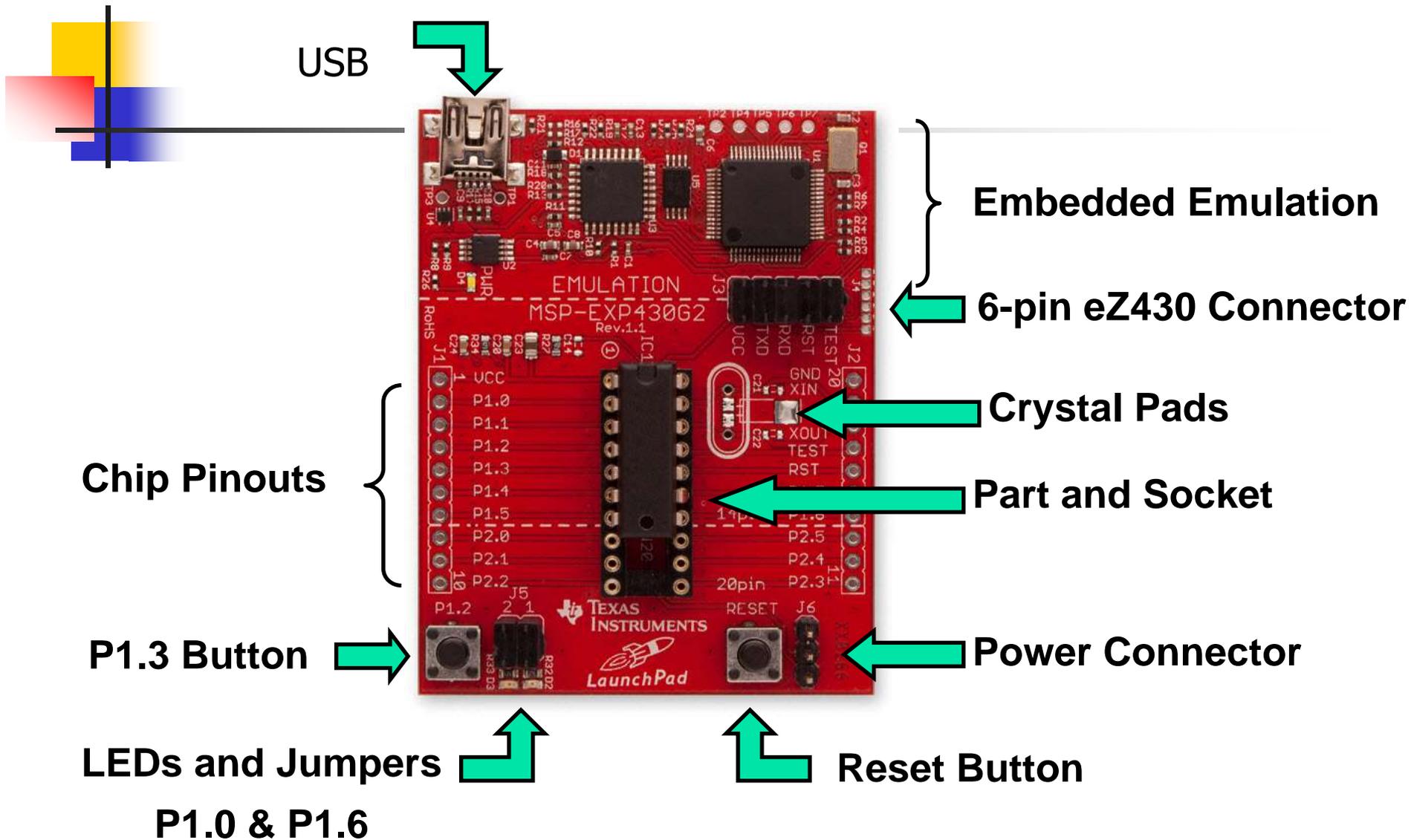


Zen for 430 LaunchPad

Chen-Hanson Ting
November 15, 2014
SVFIG



MSP-EXP430G2 LaunchPad





Summary

- Thread Model Comparison
- 430eforth v4.3
- 430eforth-IDE
- Morse Code Beacon





Thread Model Comparison

I tried three different thread models to compare, and select the best model for this book *Zen for 430 LaunchPad*.

- Subroutine Thread Model v3.3
- Direct Thread Model v4.3
- Indirect Thread Model v6.1



Thread Model Comparison

Macros	Indirect Thread	Direct Thread	Subroutine Thread
\$NEXT	mov @ip+,w mov @w+,pc	mov @ip+,pc	ret
\$NEST	DOCOLON	call #DOLST	Call <addr>
	DOCOLN: push ip mov w,ip \$NEXT	DOLST: pop w push ip mov w,ip \$NEXT	
\$UNNEST	EXIT	EXIT	ret
	EXIT: pop ip \$NEXT	EXIT: pop ip \$NEXT	
Tokens	Address	Address	Call <addr>





Compound
command

Indirect Thread Model

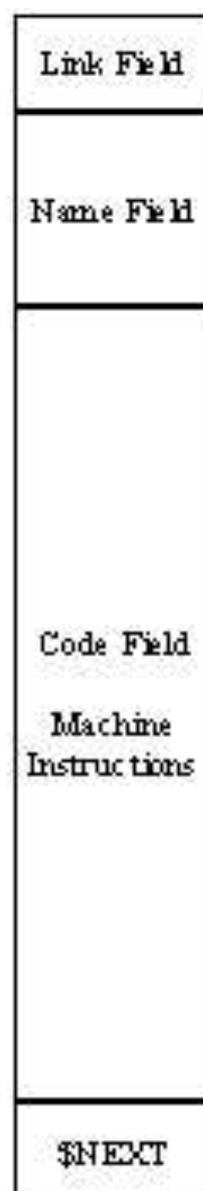


Primitive
Command

Direct Thread Model

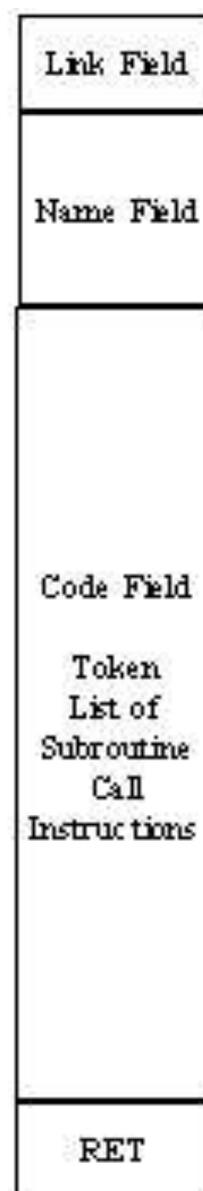


Compound
command



Primitive
Command

Subroutine Thread Model



Compound
command



Primitive
Command





Thread Model Comparison

	Indirect Thread	Direct Thread	Subroutine Thread
Overhead for primitives	6 bytes 4 cycles	4 bytes 2 cycles	6 bytes 8 cycles
Overhead for colon words	8 bytes 12 cycles	8 bytes 17 cycles	6 bytes 8 cycles
Object code	4228 bytes	4182 bytes	4938 bytes
Source code	40,453 bytes	39,453 bytes	42,323 bytes
10M empty loops	16 sec	12 sec	18 sec
10K Searches 12345	23 sec	19 sec	24 sec





Thread Model Comparison

- Direct Thread Model is the shortest, fastest, and cleanest.
- The single instruction `$NEXT` pushes it over the other two implementations:

```
$NEXT    mov @ip+,pc
```

- It affirms the direct thread model in the original eForth Model.





430eforth v4.3

- 182 Total commands
- For simplicity
 - 50 Commands are nameless
 - 132 Commands are visible
- For performance
 - 83 Primitive commands
 - 99 Compound commands



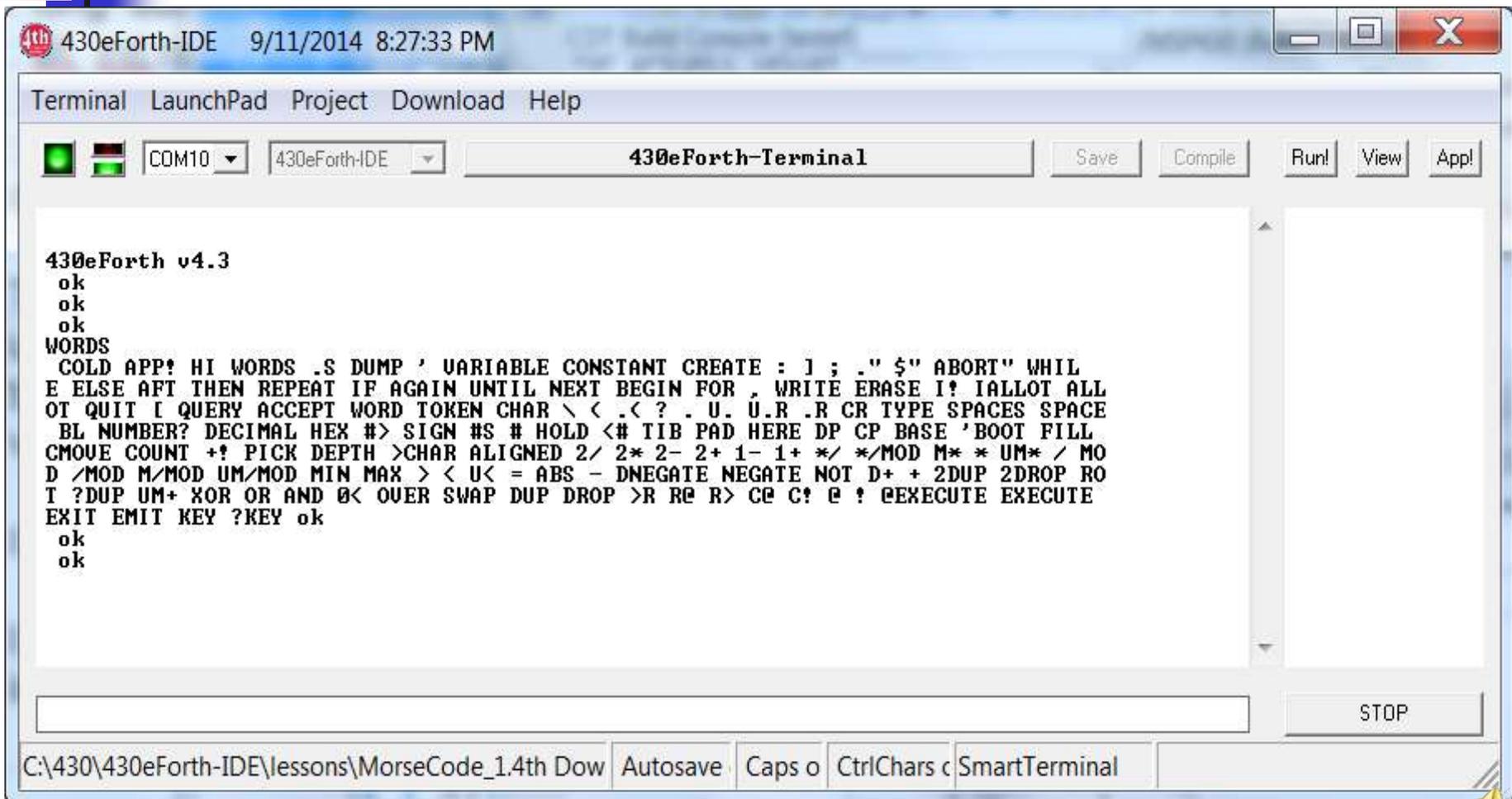


430eforth-IDE

- From Dirk Bruehl of 4E4TH.org, derived from 4E4TH-IDE
- Integrative Development Environment
 - 430eforth.a43 flash downloader
 - Terminal emulator
 - Text file downloader
 - Text editor
 - Turnkey system builder



430eforth-IDE



430eForth-IDE 9/11/2014 8:27:33 PM

Terminal LaunchPad Project Download Help

COM10 430eForth-IDE 430eForth-Terminal Save Compile Run! View App!

```
430eForth v4.3
ok
ok
ok
WORDS
COLD APP! HI WORDS .S DUMP ' VARIABLE CONSTANT CREATE : ] ; ." $" ABORT" WHIL
E ELSE APT THEN REPEAT IF AGAIN UNTIL NEXT BEGIN FOR , WRITE ERASE I! IALLOT ALL
OT QUIT [ QUERY ACCEPT WORD TOKEN CHAR \ < . < ? . U. U.R .R CR TYPE SPACES SPACE
BL NUMBER? DECIMAL HEX #> SIGN #S # HOLD <# TIB PAD HERE DP CP BASE 'BOOT FILL
CMOVE COUNT +! PICK DEPTH >CHAR ALIGNED 2/ 2* 2- 2+ 1- 1+ */ */MOD M* * UM* / MO
D /MOD M/MOD UM/MOD MIN MAX > < U< = ABS - DNEGATE NEGATE NOT D+ + 2DUP 2DROP RO
T ?DUP UM+ XOR OR AND @< OVER SWAP DUP DROP >R @e R> ce c! e ! eEXECUTE EXECUTE
EXIT EMIT KEY ?KEY ok
ok
ok
```

STOP

C:\430\430eForth-IDE\lessons\MorseCode_1.4th Dow Autosave Caps o CtrlChars c SmartTerminal



430eforth-IDE

- From Dirk Bruehl of 4E4TH.org, derived from 4E4TH-

IDE:<http://www.somersetweb.com/430eForth/430eForth-IDE.zip>

- It is the only thing you need to get eForth running on a LaunchPad.
- That's *Zen of 430 LaunchPad*





LaunchPad Experiments

Turn LED's On and Off

HEX 41 21 C! (Turn LED on)

0 21 C! (Turn LED off)

1 21 C! (Turn red LED on)

40 21 C! (Turn green LED on)





Tone Generator

Connect 8 Ohm speaker to P2.0/GND

```
HEX 1 2A C! ( P2.0 set as output)
```

```
1 2E C! (TA1.0 output to P2.0)
```

```
80 182 ! ( Set TA1.0 to toggle)
```

```
400 192 ! ( Set period count)
```

```
210 180 ! ( Start speaker)
```

```
0 180 ! ( Stop speaker)
```

It can't be any simpler!

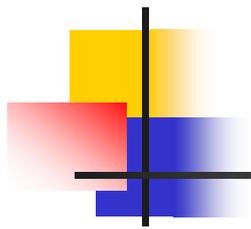




Morse Code Beacon

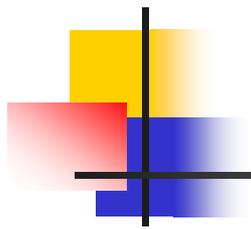
- Originally Dirk Bruehl's 4E4thMorsecode.4th
- Modified to use Timer_A1 to produce tones
- Dit's lit up red LED.
- Dah's lit up green LED.
- Here it goes.





Questions?





Thank you.

Have a great Forth DAY!

