



Zen of LaunchPad

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SVFIG

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Summary

- What is Zen?
- LaunchPad is Zen
- Forth is Zen
- 430eForth is Zen
- 430eForth-IDE is Zen
- Morse Code Beacon





What is Zen?

Nobody knows.

The word Zen means meditation.

Meditation for what?

Meditation for Enlightenment.

What is enlightenment?

Nobody Knows.





The First Zen Story

One day Śākyamuni Buddha (~500BC), the original enlightened one, lifted a flower to show his disciples. Nobody knew what he meant. Only Mahākāśyapa smiled and Buddha announced that Mahākāśyapa got enlightened.



A Flower and a Smile





How is Zen practiced now?

Enlightenment is not in Sutras or in written books.

Enlightenment is through meditations.

Enlightenment passes from masters to students orally, or through a sharp blow on the head, or something else.

Enlightenment may come suddenly, slowly, or most likely, not at all.





Forth is Zen

Forth is the simplest programming language and the simplest computer architecture.

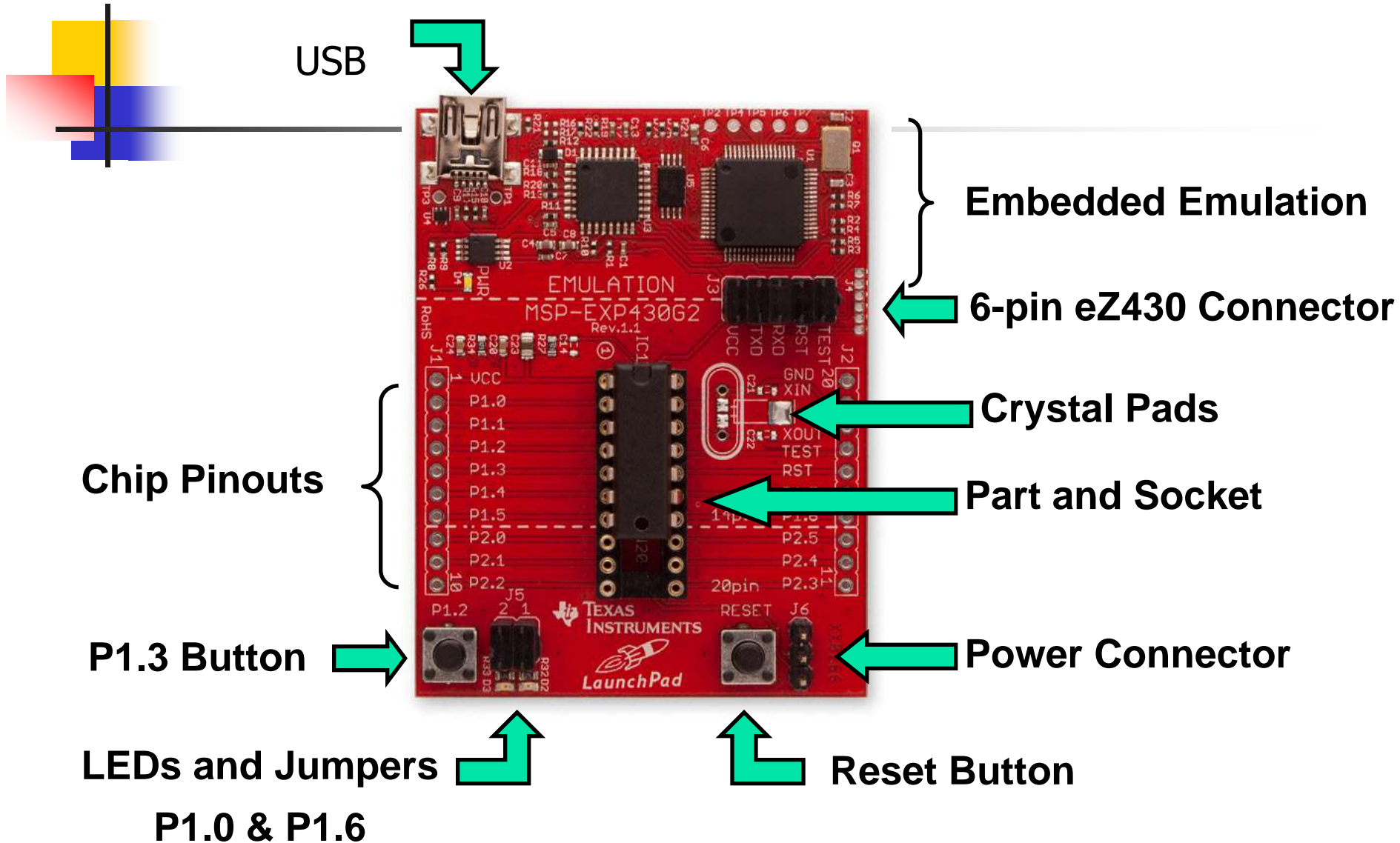
Forth is a simple list processor.

All computable problem can be solved in nested lists, which generally give the simplest solution.

People did get enlightened in Forth.



LaunchPad is Zen





LaunchPad is Zen

LaunchPad is essentially the single chip microcontroller MSPG2553.

Ignore the Emulation Part on LaunchPad, which is much more complicated than MSP430G2553. It just provides a transparent interface to IDE on PC which lost its USART port to USB.





MSP430G2553 is Zen

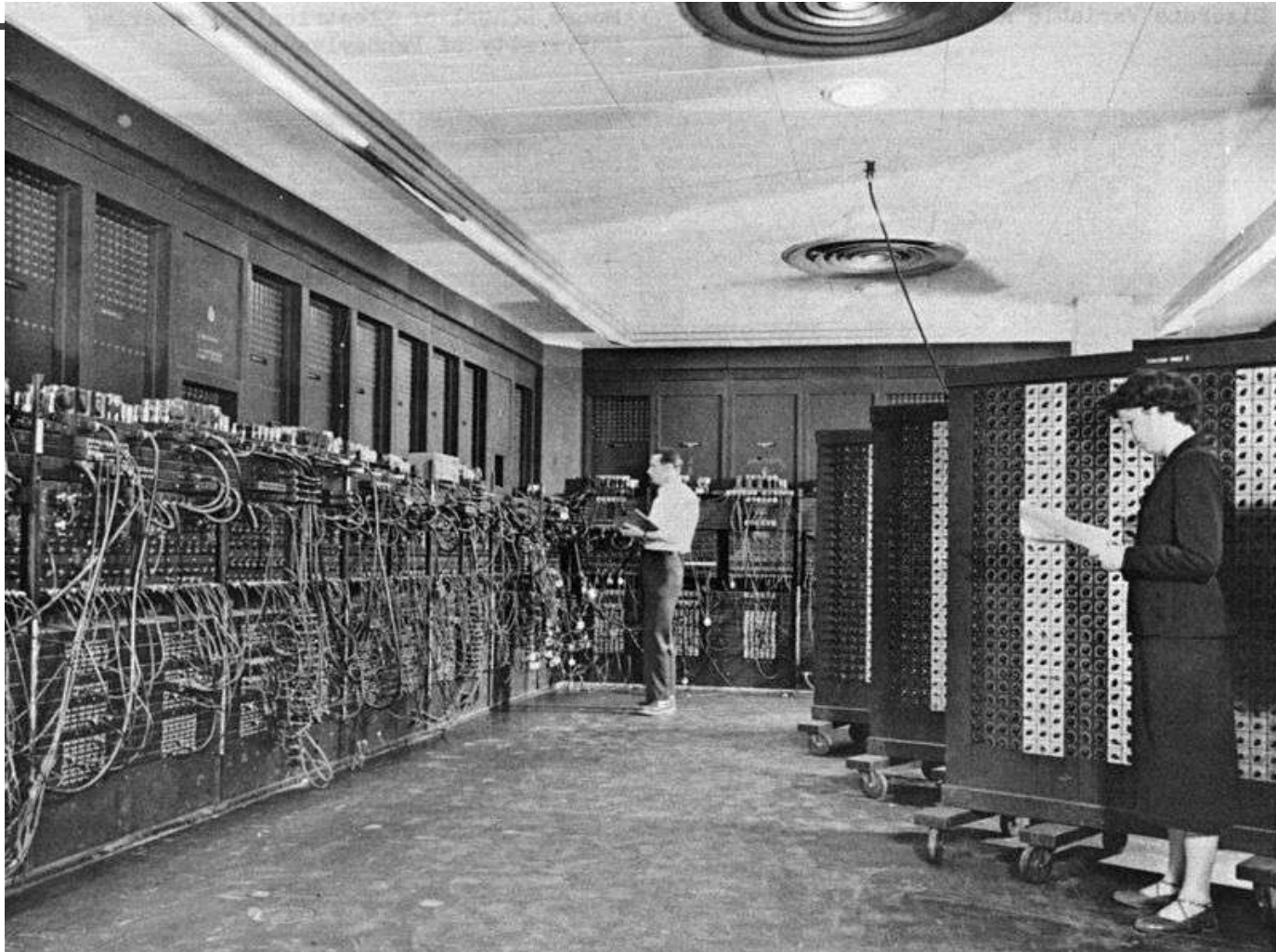
MSP430G2553 is an excellent host for a Forth Virtual Machine.

16 KB of flash memory and 4 KB of RAM.
Serial Communications devices including an USART needed by Forth.

Many other I/O devices for wide range of applications in a 20 pin DIP package.



MSP430G2553 is an ENIAC





Thread Model Comparison

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

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





430eForth v4.3 is Zen

- Only 182 total commands
 - 125 Commands are visible
 - 83 commands in assembly
 - 57 Commands are nameless
- It only takes 4134 bytes in flash memory.





430eForth v4.3 is Zen

- 125 commands define the simplest Forth Language for programming real applications on LaunchPad.
- With LaunchPad, it is ideally suitable for young students and first time Forth programmers.





430eForth-IDE is Zen

- A gift from Dirk Bruehl of 4E4TH.org, derived from 4E4TH-IDE.
- Integrative Development Environment
 - Flash downloader
 - Terminal emulator
 - Text file downloader
 - Integrated Editor, Compiler, Command Viewer, Debugger, and Turnkey services





430eForth-IDE is Zen

- Very small package.
- Include all IDE services.
- Assume a valid 430eForth.a43 image.
- Best companion for 430eForth and for LaunchPad.



Terminal LaunchPad Edit Download Help

COM10 ▾
430eForth-IDE_4 ▾
430eForth-Terminal
Save
Compile
Run!
View
App!

430eForth v4.3

```

ok
ok
ok
ok
WORDS
COLD APP! HI WORDS .S DUMP ' VARIABLE CONSTANT CREATE : ] ; ." $" ABORT" WHILE
ELSE APT THEN REPEAT IF AGAIN UNTIL NEXT BEGIN FOR , WRITE ERASE I! IALLOT ALLOT
QUIT I QUERY ACCEPT WORD TOKEN CHAR \ < .< ? . U. U.R .R CR TYPE SPACES SPACE B
L NUMBER? DECIMAL HEX #> SIGN #S # HOLD <# TIB PAD HERE DP CP BASE 'BOOT FILL CM
OVE COUNT +! PICK DEPTH >CHAR ALIGNED 2/ 2* 2- 2+ 1- 1+ */ */MOD M* * UM* / MOD
/MOD M/MOD UM/MOD MIN MAX > < U< = ABS - DNEGATE NEGATE NOT D+ + 2DUP 2DROP ROT
?DUP UM+ XOR OR AND Ø< OVER SWAP DUP DROP >R R@ R> C@ C! @ ! @EXECUTE EXECUTE EX
IT EMIT KEY ?KEY ok

```

STOP





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 Michael Kalus' 4E4thMorsecode.4th
- Modified to use Timer_A1 to produce tones
- Dit's lit up red LED.
- Dah's lit up green LED.



Terminal LaunchPad Edit Download Help

COM10 ▾
430eForth-IDE_4 ▾
430eForth-Terminal
Save
Compile
Run!
View
App!

```

: SOS dit dit dit dah dah dah dit dit dit .. ; ok
< Mayday! Without character pauses!> ok
: UE U E ; < Understood> ok
: >> F O R T H // I S // S U P E R ; ok
: TITANIC BEGIN SOS // ?KEY UNTIL DROP ; ok
: ZEN
  Z E N // F O R // _ 4 _ 3 _ 0 // L A U N C H P A D // A R
; ok
< finis> ok
' HI APP!
ok
ZEN
ok
SOS
ok
TITANIC
ok

```

- ZEN
- TITANIC**
- >>
- VE
- SOS
- SK
- SGD
- OK
- NR
- KN
- KA
- IMI
- II
- HH
- GE
- GD

kk

STOP



RUN! VIEW APP!

These are three buttons above the Word-List-Panel on top right corner.

- RUN! Execute a highlighted command
- VIEW Display source code of highlighted command
- APP! Execute a highlighted command on Reset or Power-up





RUN! VIEW APP!

Here MorseCode.4th is Downloaded and compiled.

Demos:

ZEN

SOS

TITANIC





Zen of LaunchPad

Chap1. Zen of Things

Chap2. 430eForth-IDE for LaunchPad

Chap3. Assembling 430eForth

Chap4. 430eForth Source code

Conclusions

Appendix: 430eForth Commands





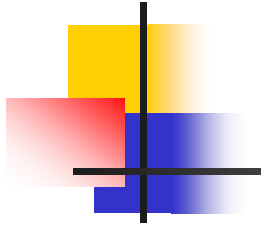
Here is a Flower.





Do I see a Smile?





Thank you.
Merry Christmas and
Happy New Year!

