



Please ignore the wizzard behind the curtain



A perfect Storm

MiniDebConf Cambridge 2016

Daniel Silverstone <dsilvers@digital-scurf.org>

A red, hand-drawn style spiral graphic that starts from the center and expands outwards, partially overlapping the text box.

A disclaimer

Programmable hardware



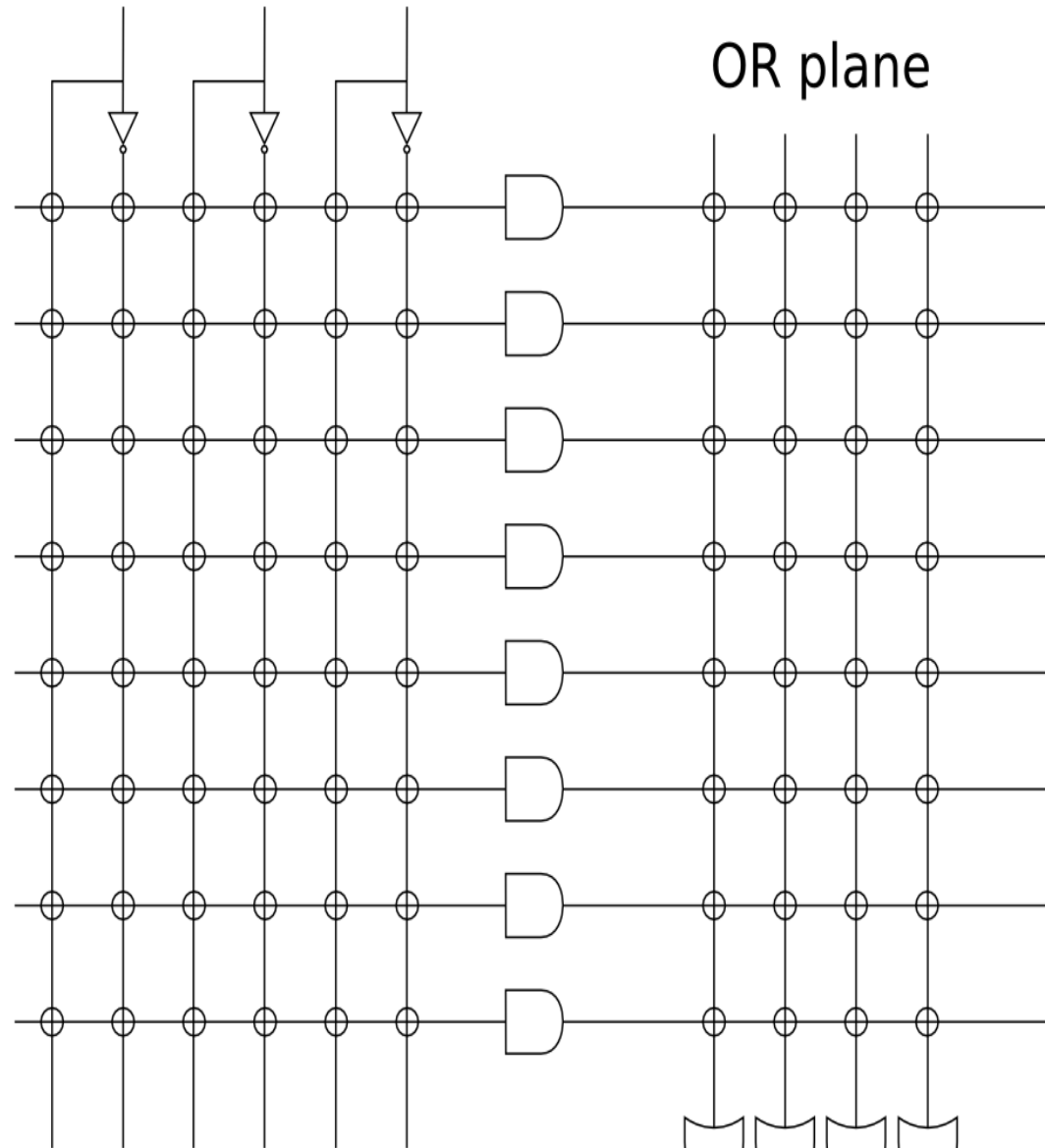
A dramatic night scene featuring a long pier with a metal railing leading towards a lighthouse. The sky is dark and stormy, with several bright lightning bolts visible. The lighthouse on the left emits a green beam of light. The text is overlaid on a dark rectangular background in the center of the image.

Before 'true' programmable hardware...
...there were (P)ROMs

PLAs/PALs/GALs - Programmable Logic Arrays

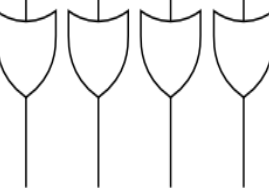
A dramatic night scene featuring a long pier with a metal railing leading towards a lighthouse. The sky is dark and stormy, with several bright lightning bolts striking down. The lighthouse on the left is illuminated with a green light, while the one on the right is illuminated with a yellow light. The water is dark and choppy, reflecting the light from the lighthouses and the lightning.

input



OR plane

AND plane

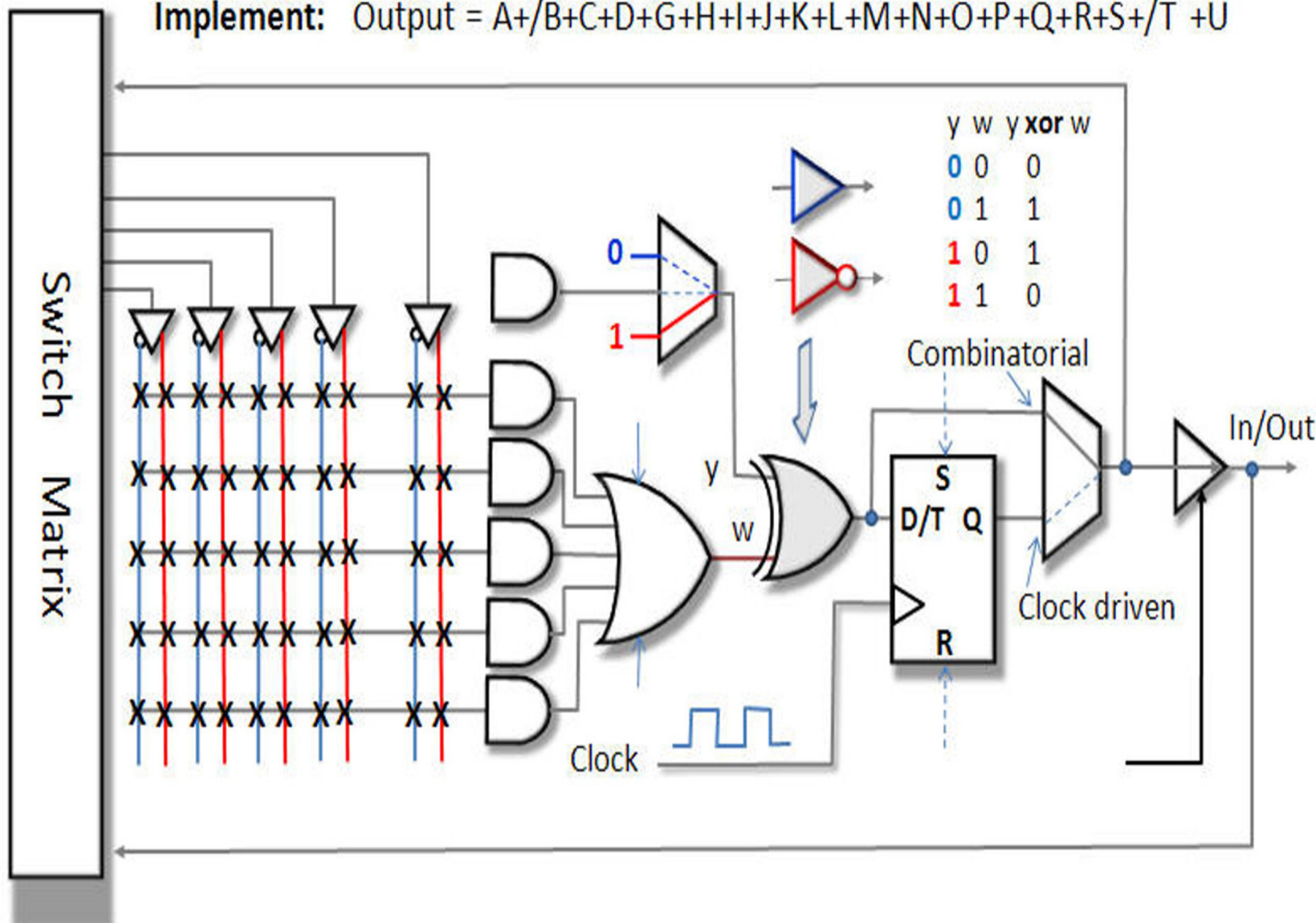


output

CPLDs and FPGAs.



Implement: $\text{Output} = A + B + C + D + G + H + I + J + K + L + M + N + O + P + Q + R + S + T + U$



CLB

1

LUT = 16x1 bit RAM

2

Mux controlled by input I select the "active" LUT

3

This Mux select among the LUTs and combined LUT

4

Rising or Falling edge

5

Latch and Flip/Flop

6

Combinatorial output direct from a LUT or Clk-controlled from F/F

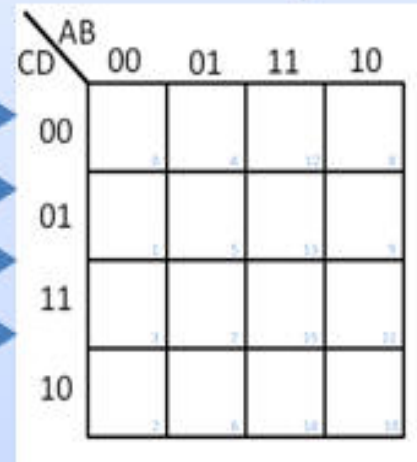
1 LUT = Look Up Table

CD \ AB	00	01	11	10
	00	01	11	10
00				
01				
11				
10				

LUT = Look Up Table

GH \ EF	00	01	11	10
	00	01	11	10
00				
01				
11				
10				

2 I Clk



Latch / Flip-Flop

XQ

CPLDs and FPGAs.

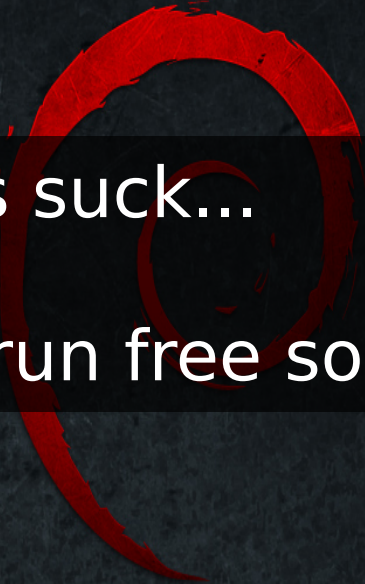




Hybrid hard/soft hardware

e.g. Altera SocFPGA

e.g. Xilinx Zynq-7000



Proprietary toolchains suck...

...even when we can run free software over the top



The IceStorm project

<http://www.clifford.at/icestorm/>

<https://github.com/cliffordwolf/icestorm.git>

A photograph of a winter scene. In the foreground, a wooden hammock stand is partially visible, with a hammock that is heavily laden with long, thin icicles hanging from its edges. The ground is covered in a layer of snow. In the background, a white house with a snow-covered roof and a dormer window is visible. Bare, snow-laden tree branches frame the top and right sides of the image. A semi-transparent black banner with white text is overlaid across the middle of the image.

IcePack, IceProg, IcePLL, ...



IceBox

A winter scene with snow-covered trees and a house in the background. In the foreground, there are large, light blue, fringed objects, possibly hammocks or blankets, draped over a wooden frame. The ground is covered in snow. A semi-transparent dark rectangle is overlaid in the center, containing white text.

Place'n'Route: arachne-pnr

<https://github.com/cseed/arachne-pnr.git>

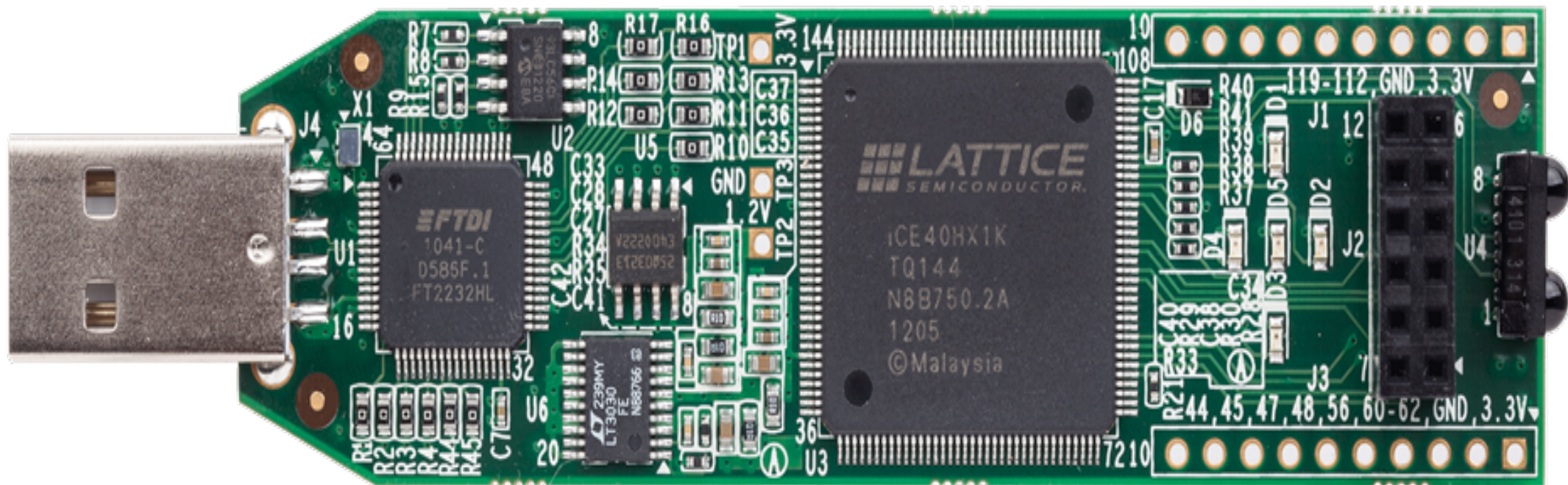


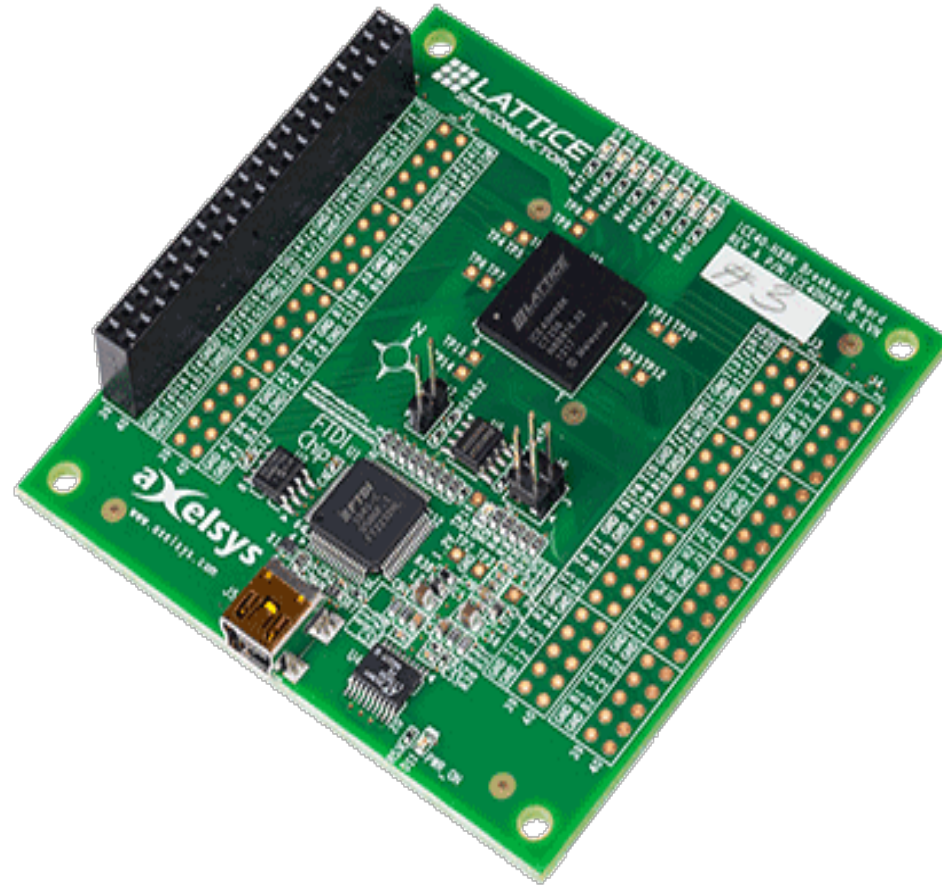
Synthesis: yosys

<https://github.com/cliffordwolf/yosys.git>



So what hardware can we use this with?





Or...

There's the MyStorm project...

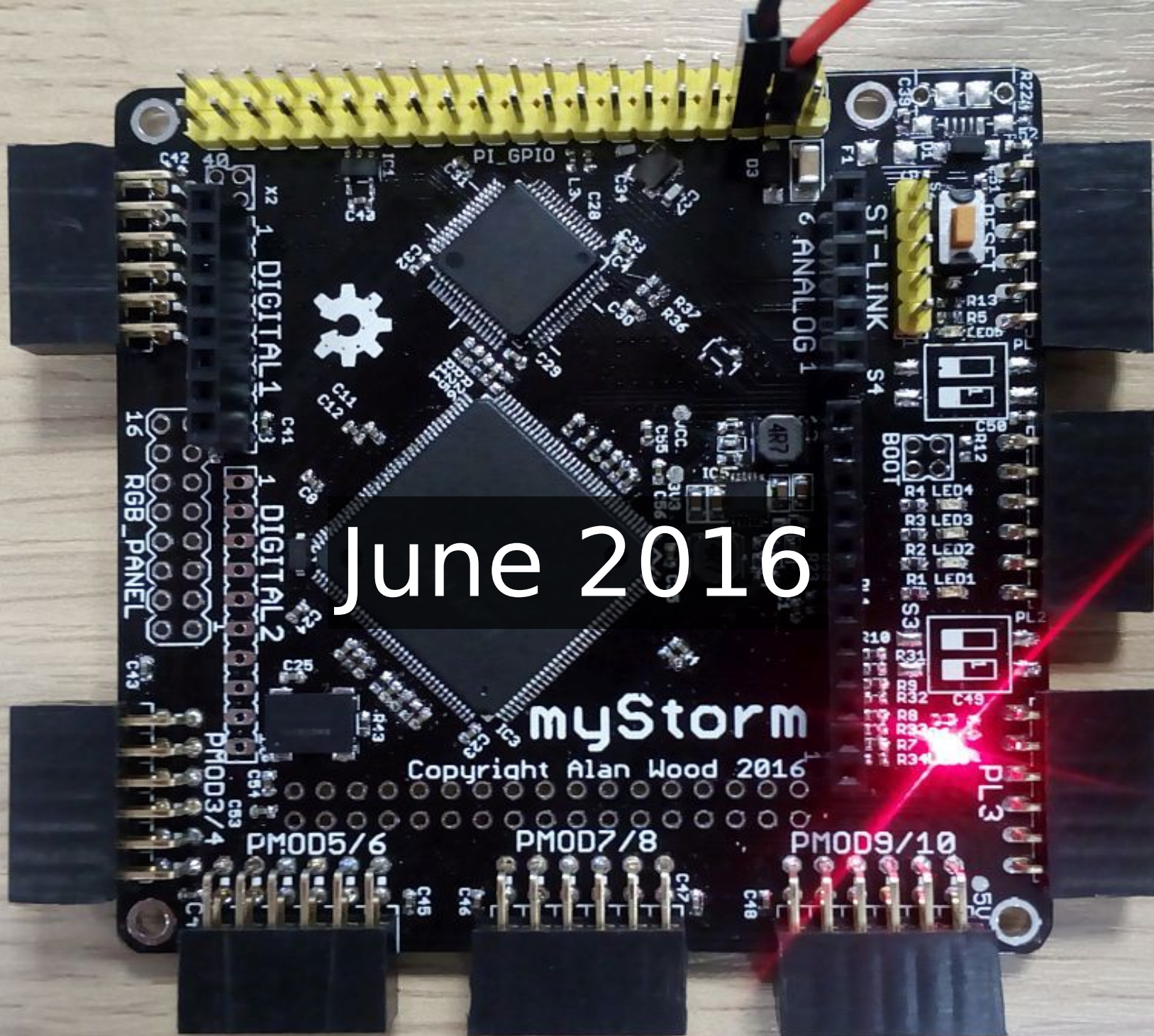
<https://mystorm.uk/>

<https://forum.mystorm.uk/>

May 2016



June 2016





October 2016 - MyStorm SDK



October 2016 - MyStorm SDK



October 2016 - MyStorm SDK



The future...



"Live" demo



Platform.10



Anatomy of a basic hardware project



PLLs once more



A Stormtrooper from Star Wars stands on a dark, wet, and reflective surface, possibly a rooftop or a street. The trooper is holding a blue, patterned umbrella over their head. The background is dark and blurry, suggesting a rainy night. A semi-transparent black banner with white text is overlaid across the middle of the image.

Free software toolchain all the way down

A white Stormtrooper from Star Wars stands on a dark, wavy surface, holding a blue and green patterned umbrella. The background is dark and blurry.

Extra credit (untested) add one MOAR PLL



Any questions?

<https://mystorm.uk/>

<https://forum.mystorm.uk/>