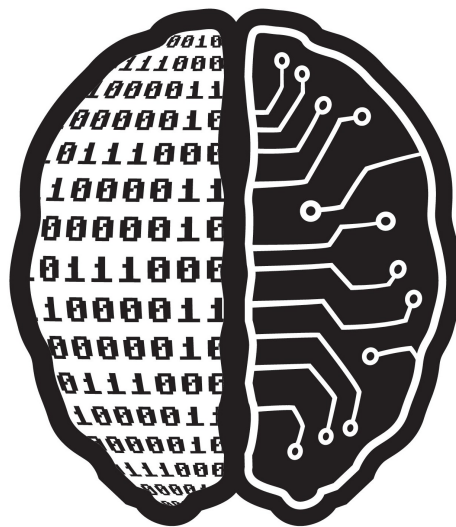# 1st Parallella Technical Conference
Tokyo
May 30, 2015

PARALLELLA
PAST

Parallel Computing History

Ambric Cognivue Cswitch SiByte Sandbridge

Asocs Cell CPU Tech Intellasys SiCortex Trips

Aspex Coherent Logix Rapport Silicon Hive

Axis Semi Cradle IP-Flex

Clearspeed Greenarrays Recore Venray

BOPS Calxeda Plurality Spiral Gateway

ElementCXI Icera Inmos

Boston Circuits Quicksilver Stream Processors

Morphics

Intrinsity Tabula

Brightscale Stretch Picochip Tilera

PACT

Octasic XMOS

Movidius Mathstar Zilabs

Chameleon

Active

Post Mortem Interview

ZERO GENERAL PURPOSE SUCCESS STORIES!!! WHY??

IT'S THE SOFTWARE!!!

My History (1998-2008)

- TigerSharc DSP (1,2,3)
- Wireless Communication
- Led execution/power team
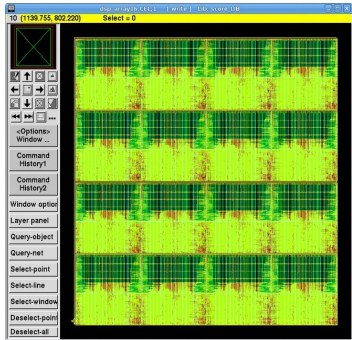- Technology success
- Financial failure
- 100 people,$100M in losses

- ADI "ISATG" CCD interfaces
- SOC Architect/Designer
- Custom RISC architecture
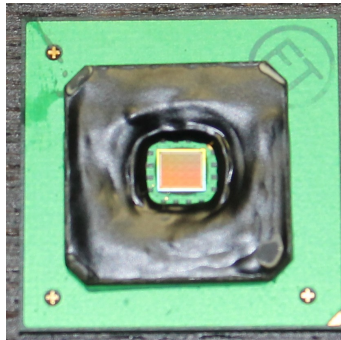- 2-3 person digital teams
- Sony, Fujifilm, Canon
- $$$,$$$ in revenue

Adapteva Before Parallella

Built World's Most Efficient Processor
~$2M Total Money Spent

| Epiphany0	Epiphany-I	Epiphany-II	Epiphany-III	Epiphany-IV
2008	2009	2010	2010	2011
Simulation	Prototype	Prototype	Product	Product*
16 cores	16 cores	16 cores	16 cores	64 cores
$0	$200K	$1.5M	$0	$500K
65nm	65nm	65nm	65nm	28nm

But Adapteva was still dying so...

Parallella Project (Sept 2012)

- GOAL: help parallel happen
- Single Board Computer
- Credit card sized
- 2 ARM + 16/64 Epiphany cores
- 1GB RAM,GigE,uUSB,uHDMI,uSD
- ~50Gbps Total IO
- <5W
- Open source
- $99 starting price
- $898K raised
- ($3M 64core target not reached)
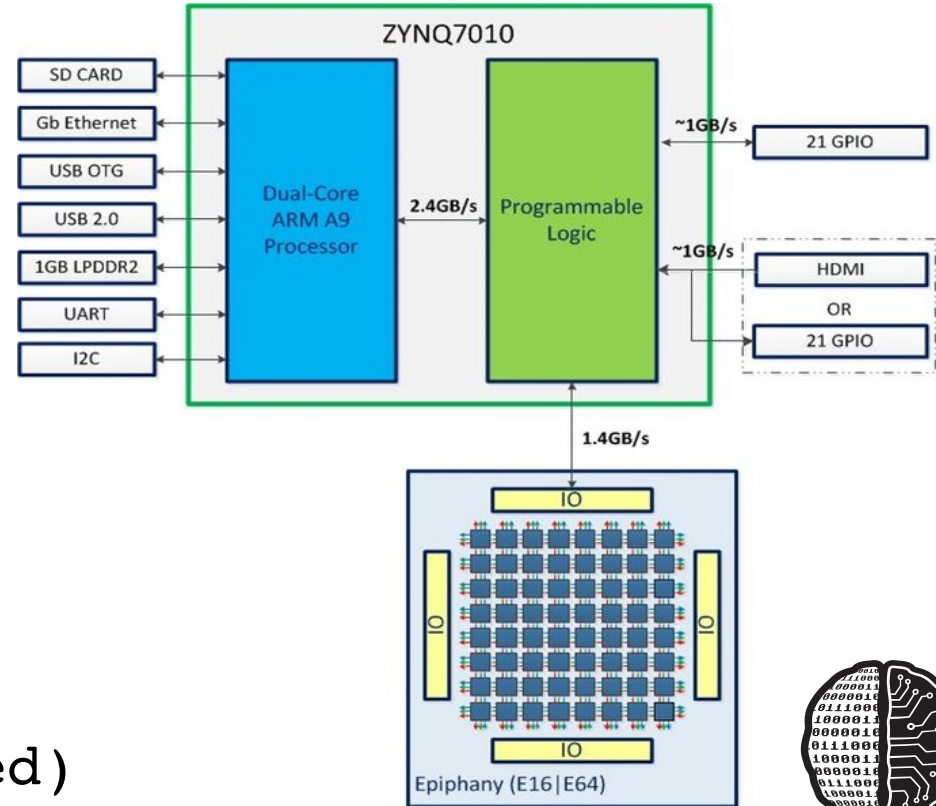
The Parallella Project Goal

To build a hardware platform that democratizes access to parallel computing hardware.

(affordable, open, available)

Why open?

Customers/Developers:(WIN)
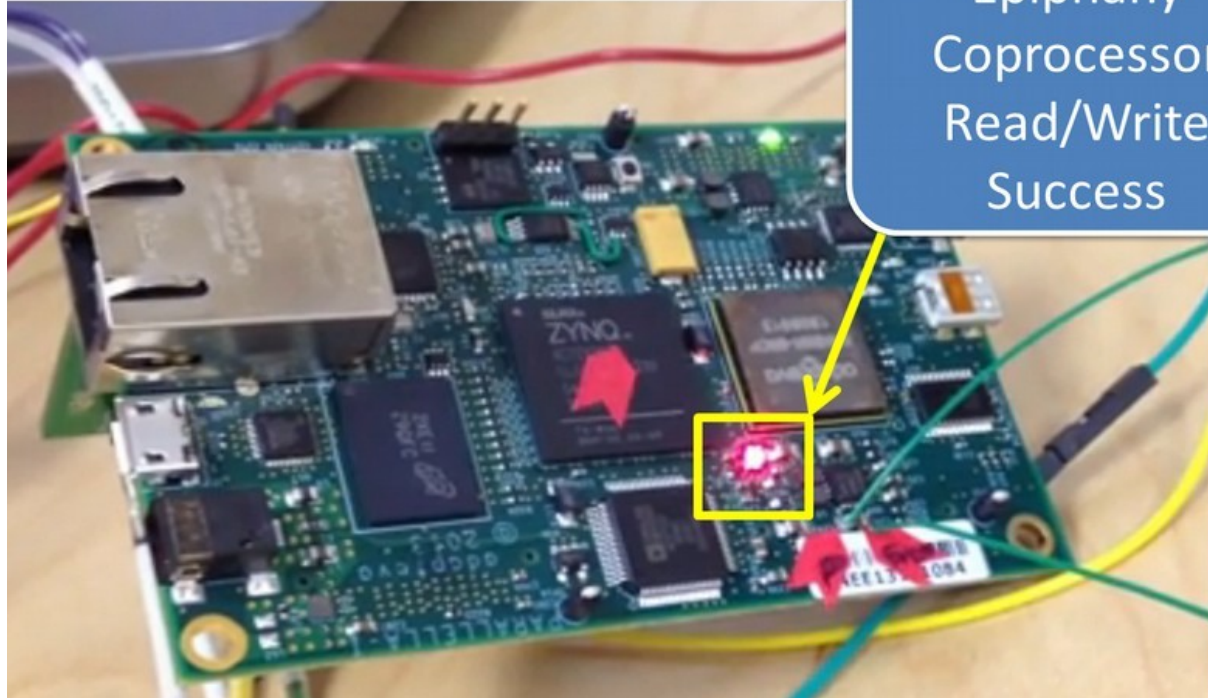
- Empowers
- Reduces risk

Makers:(WIN)

- Fights FUD
- Reduces support burden
- Easier collaboration
- Enables ECO-system
- Free review / feedback
- Karma points (good will)

open source
hardware

First Powerup (May 2013)

- Gen0 (RevA)
- It worked!
- Power too high
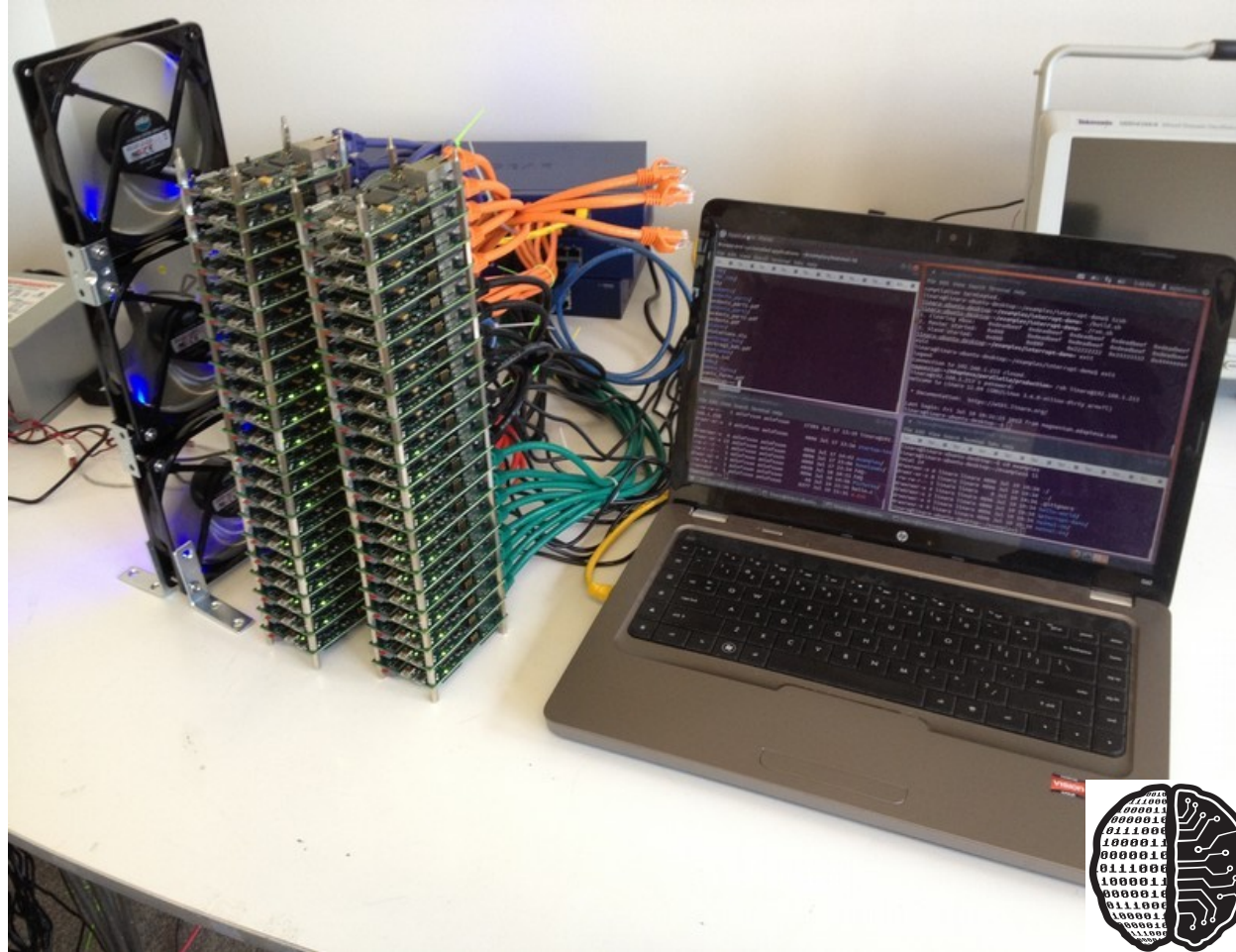- HDMI not working
- But all other design targets met!

Epiphany Coprocessor Read/Write Success

Gen0 Shipment (July 2013)

- We build working cluster with 42 boards!
- Sent out 50 boards to early KS backers
- ~1 saw real use
- Pattern??

Chips Arrive (Aug 2013)

- Full mask tapeout
- New package
- Great thermals
- 50,000 built
- ~90% yield!

BIG SUCCESS!!

New Investment (Dec 2013)

- Delays and cost overruns almost killed us
- $3.6M from Ericsson+VC saved the project!!
- Complete restart with new engineering team
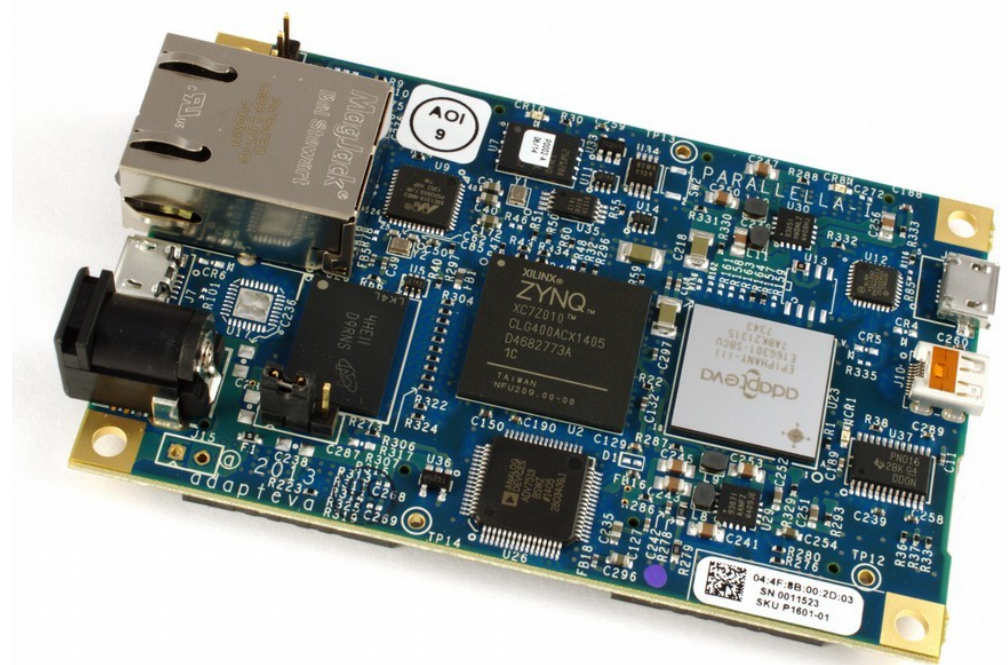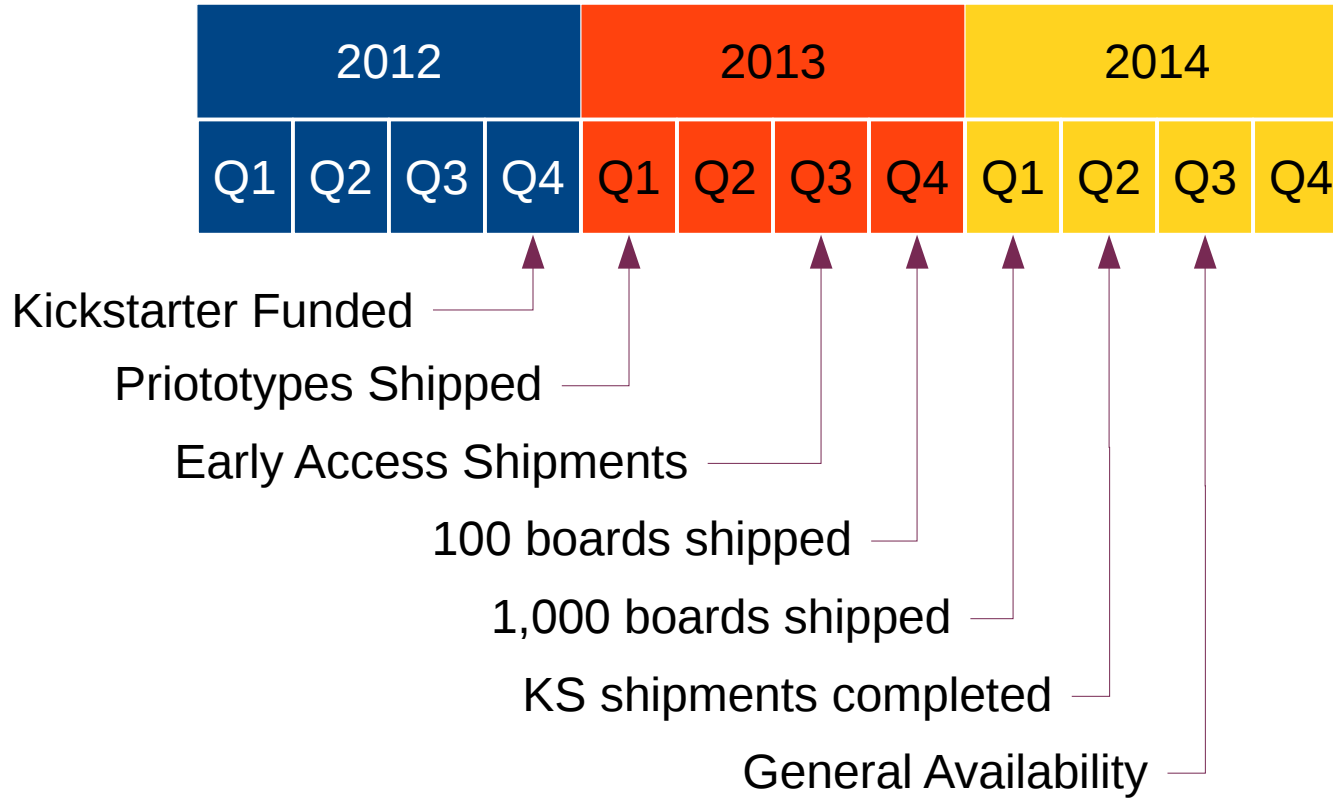- 5,000 waiting customers
- The worst time of my life...

ERICSSON

Product Version (Jan 2014)

- RevC

- Supply issues stalled mass production

- Still, all shipments done by May 2014

- ~1 year late

Parallella Kickstarter Timeline

2012				2013				2014			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Kickstarter Funded

Priototypes Shipped

Early Access Shipments

100 boards shipped

1,000 boards shipped

KS shipments completed

General Availability

The "A1" Experiment (Jun 2014)

- International Supercomputing Conference
- 32 Parallella-64 boards
- 2,112 RISC processors
- 200 Watts
- 15 GFLOPS/Watt efficiency
- 15cm x 15cm x 68 cm
- No traction???

PARALLELLA
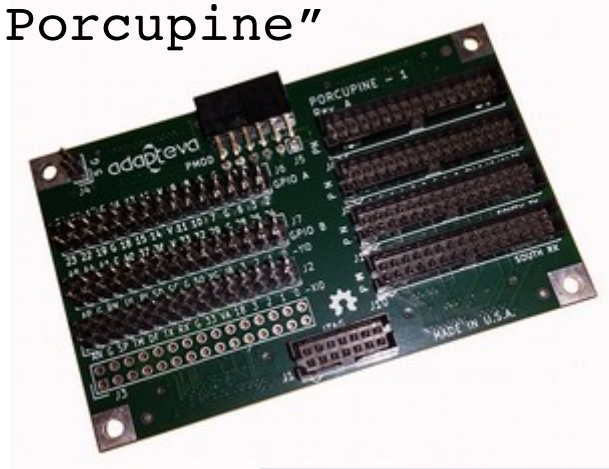
PRESENT

Parallella Open Source Hardware

"Microserver"
"Desktop"
"Embedded"

"Porcupine"

Ground
Electronics

Parallella Open Source Software

- MPI (David Richie)

- OpenMP (University of Ioannina, Greece)

- OpenCL (David Richie)

- Erlang NIF (Mark Flemming)

- BSP (University of Utrecht, Netherlands)

- Basic (Nick Brown)

- COPRTHR / STDCL (David Richie)

- RTEMS (Hesham M. AL Matary)

- APL, Forth, Occam, Haskell(TBD, in play)

The Parallel Architectures Library

- A new "standard library" for parallel
- Compact C library with optimized routines for vector math, dsp, synchronization, and multi-processor communication.
- Designed to be portable across multiple ISAs
- Open source (apache 2.0 permissive license)
- Open invitation to participate!!
- https://github.com/parallella/pal

Parallella by the Numbers

- Over 10,000 Parallella boards shipped

- Over 6,000 boards in stock

- 200 Universities

- 17 academic publications

- 16 open source community projects

- 11 supported programming models

- 12K posts at forums.parallella.org

- Good start, but not enough

PARALLELLA FUTURE

Parallella 2015 Plans

- **Software (PAL)**

  – Effort started, 5 contributors

- **Fun applications**

  – SDR (see demo)

  – Imaging (see Porcupine)

- **Teaching**

  – Programming book will be on github

- **Epiphany-V**

New Parallella Project Goal

To make parallel programming easy and fun!

How to Contribute?

- **PAL (SW):github.com/parallella/pal**

- **OH (HW): github.com/parallella/oh**

- **Examples: github.com/parallella/parallella-examples**

- **Education: Teach through articles / blog posts**

Let's Change Software Forever

No Computing | Parallel Computing

No
Computing
0-->1943

Serial
Computing
1943-2015

Ubiqutous
Parallel
Computing
2015 --> ∞
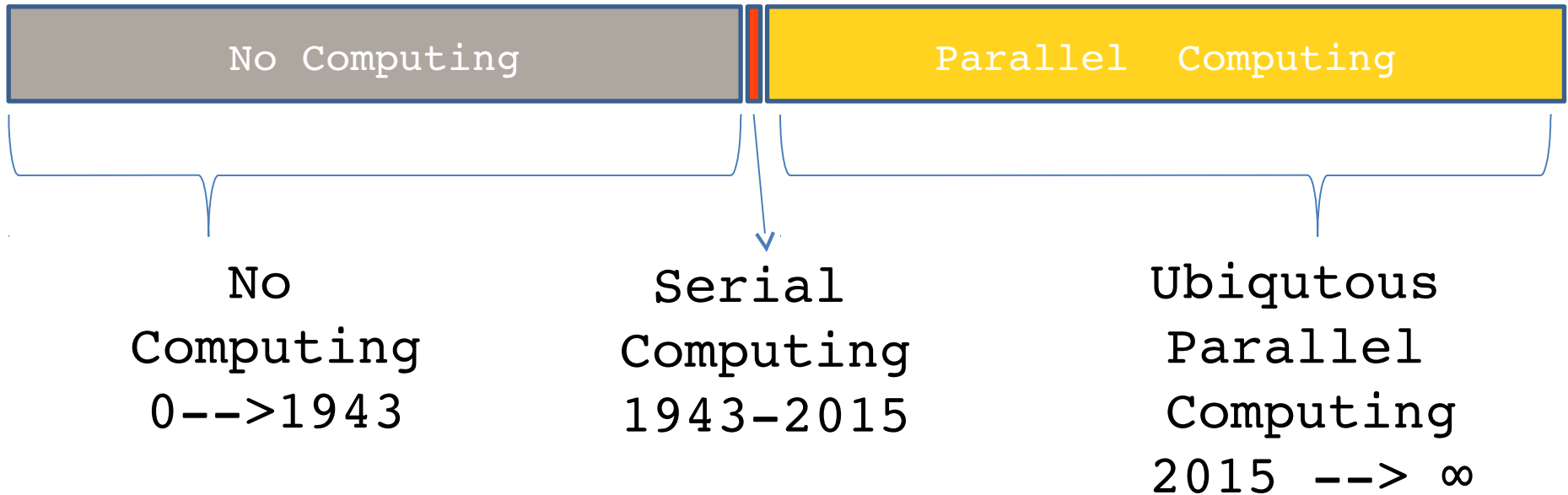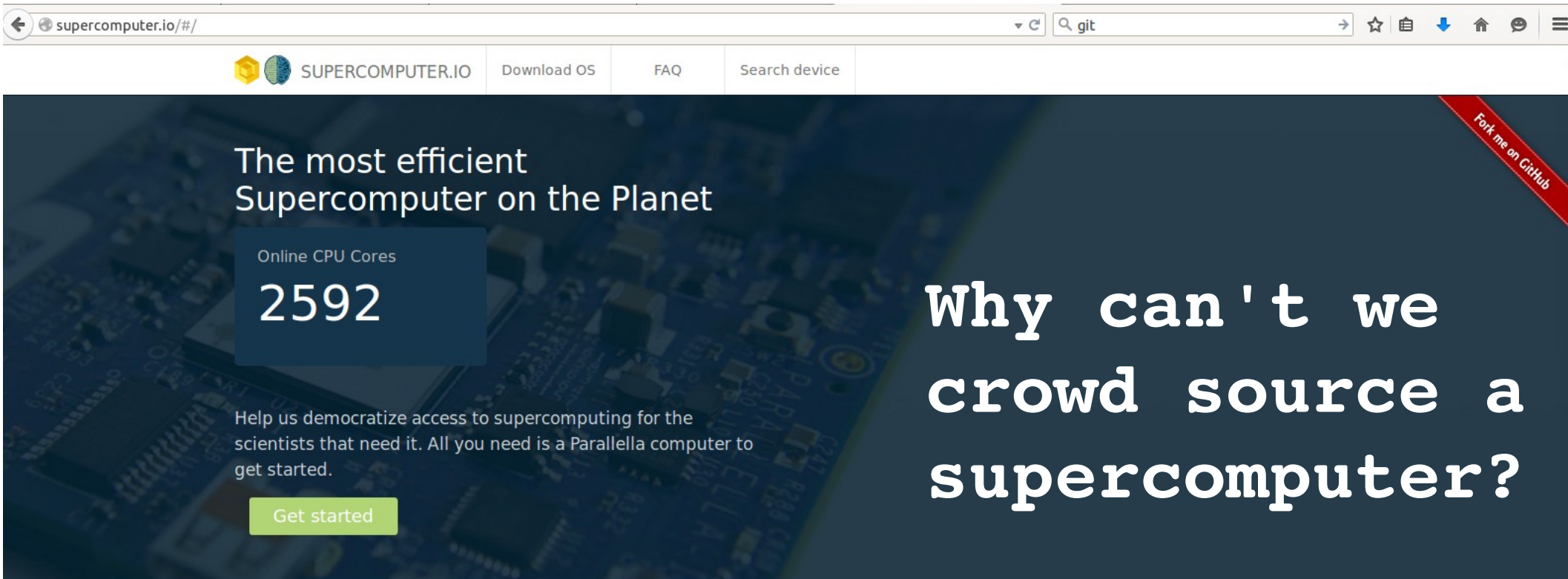
Not a question of if, but when!
This is a once in a universe opportunity!

ANNOUNCEMENTS

#1. SUPERCOMPUTER.IO

supercomputer.io/#/

Q git

SUPERCOMPUTER.IO   Download OS   FAQ   Search device

Fork me on GitHub

The most efficient Supercomputer on the Planet

Online CPU Cores

2592

Help us democratize access to supercomputing for the scientists that need it. All you need is a Parallella computer to get started.

Get started

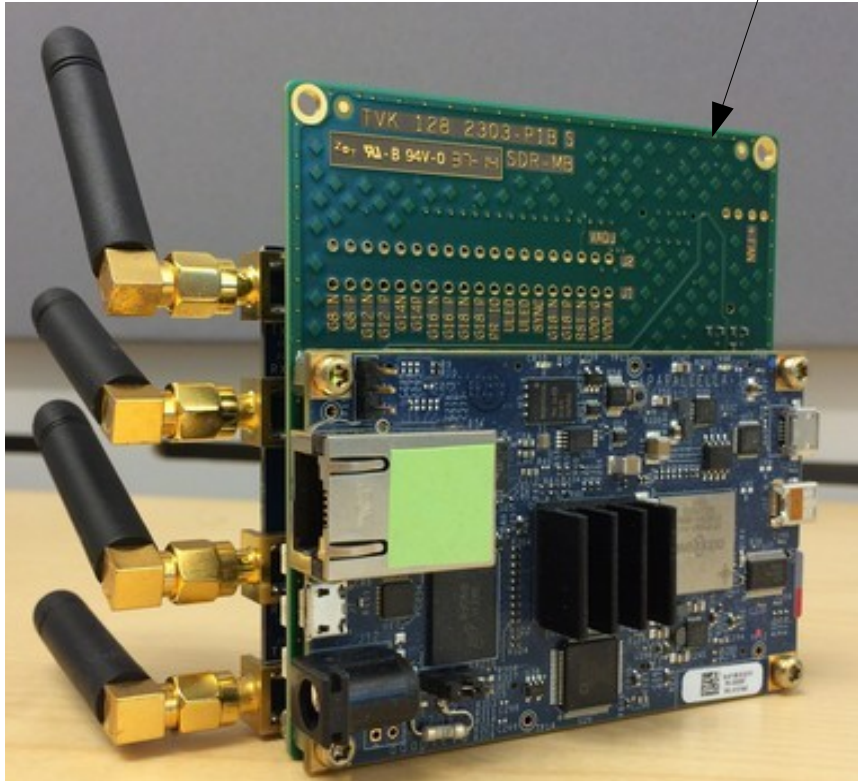## Why can't we crowd source a supercomputer?

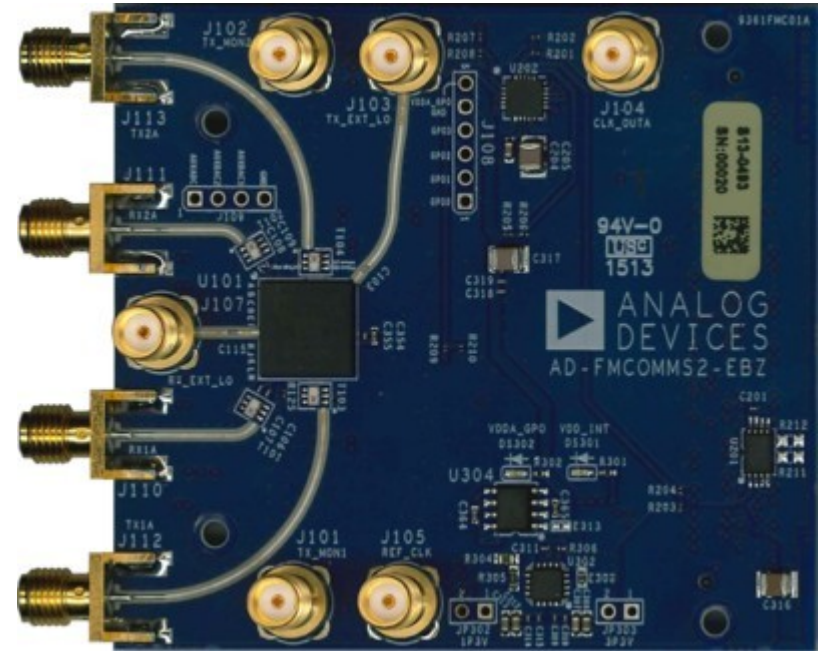The first live test will be run at the Parallella Technical Conference in Tokyo on May 30th!

#2 New SDR Platform

New Adapter Board

FCOMMS2
(from Analog Devices)

- Based on RFIC AD9361
- 12 bits DACS/ADCs
- 70 MHz — 6 Ghz
- RF 2 × 2 transceiver
- 56MHz BW

#3 New Imaging Platform

PMOD

elinks

48 IO
I2C
UART

WANTED!
Working
Raspberry Pi
Camera Module
$1000 Reward

JTAG

Raspberry Pi
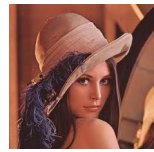Camera Interface

#4 The PAL Bounty System

- A free Parallella board for every PAL function contributed

- Sponsored by Adapteva

- Math, DSP

- github.com/parallella/pal

        (Terms to be published at

            parallella.org/pal)

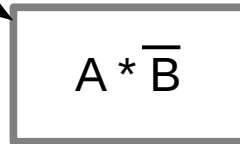# #5 Image Recognition Demo with supercomputer.io & Parallella

- "Naive" but educational fast convolution
- Leverages Epiphany FFT performance,
- 280 images/sec per board, still optimizing...