

# The Parallella Computer and the Epiphany Chip

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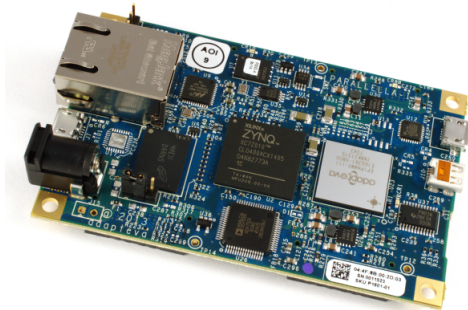
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The Kickstarter

The Epiphany

The Parallella

# Key Definitions

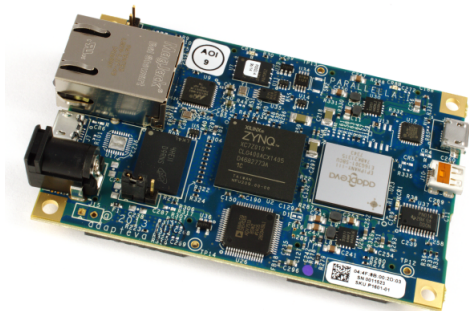


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# Key Definitions



- ▶ **Adapteva:** The company behind the Epiphany and the Parallella
- ▶ **Epiphany:** A highly-parallel processor
- ▶ **Parallella:** A single-board computer that showcases the Epiphany
- ▶ **Me:** One of the original backers of the Parallella campaign on Kickstarter

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## The Kickstarter Kicks Off

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- ▶ I backed at the \$1,140 level to receive a cluster of eight Parallella machines.
- ▶ On October 27, 2012, the campaign ended with \$898,921 raised against a goal of \$750,000
- ▶ The website cheerfully promised that my boards would ship by next May.

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- ▶ At the end of November, an email titled "Finally a breakthrough!" promised an "announcement" on December 6th, and that all boards would ship by the end of January.
- ▶ Two days later, Adapteva CEO Andreas Olofsson followed me on Twitter!



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- ▶ My boards actually shipped in late April of 2014, not May of 2013 as originally promised

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# Motivation

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Wrong!



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- ▶ Multi-core CPUs use instruction-level parallelism
  - ▶ Different cores execute different instructions simultaneously
- ▶ GPUs typically use data-level parallelism
  - ▶ Multiple "cores" execute the same instruction on different memory addresses
  - ▶ Similar to SIMD instructions like Intel SSE

## Example

```
if (get_global_id(0) % 2 == 0) {  
    do_something();  
} else {  
    do_something_else();  
}
```

## Example

Even cores

---

```
get_global_id() % 2 == 0
```

```
do_something()
```

```
NOP
```

Odd cores

---

```
get_global_id() % 2 == 0
```

```
NOP
```

```
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```

## Concept

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- ▶ All those cores are fully independent of each other

## Epiphany III

- ▶ 16 full RISC cores
- ▶ 1 GHz
- ▶ 0.5 MB memory on chip
- ▶ 2 watt maximum power consumption

## Epiphany IV

- ▶ 64 full RISC cores
- ▶ 800 MHz
- ▶ 2 MB memory on chip
- ▶ 2 watt maximum power consumption
- ▶ Not generally available



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- ▶ What didn't work
  - ▶ Mostly only programmable in OpenCL and C (some support for Python and BASIC)
  - ▶ Not enough memory
  - ▶ Failed to achieve critical mass



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## Parallella Features

- ▶ Zynq SoC
  - ▶ 2 ARM A9 cores
  - ▶ FPGA
- ▶ Gigabit Ethernet
- ▶ Micro HDMI port and 2 micro USB 2.0 ports (on some models)
- ▶ 1 Gb SDRAM
- ▶ Micro-SD slot (boots from SD cards)
- ▶ GPIO pins (on some models)
- ▶ Draws only 5 watts!
- ▶ Manufacturer supports Ubuntu, provides FOSS drivers

## Parallela Versions

	Microserver	Desktop	Embedded
CPU	Zynq 7010	Zynq 7010	Zynq 7020
Logic Cells	28k	28k	80k
DSP Slices	80	80	220
eLinks Expansion	0	2	2
GPIO Pins	0	24	48
USB and HDMI	No	Yes	Yes

The

End