

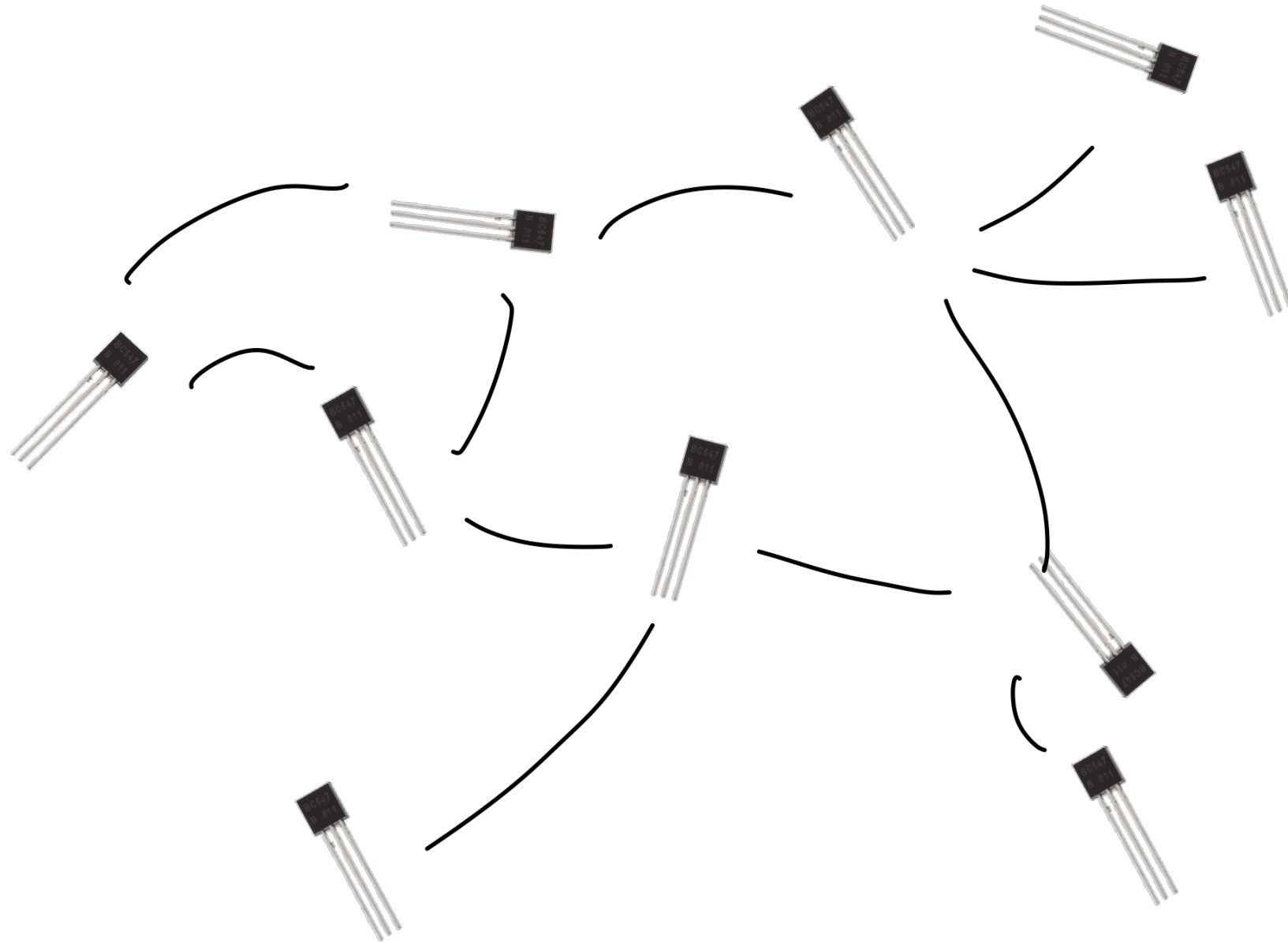
# FPGAs Have the Wrong Abstraction

Adrian Sampson

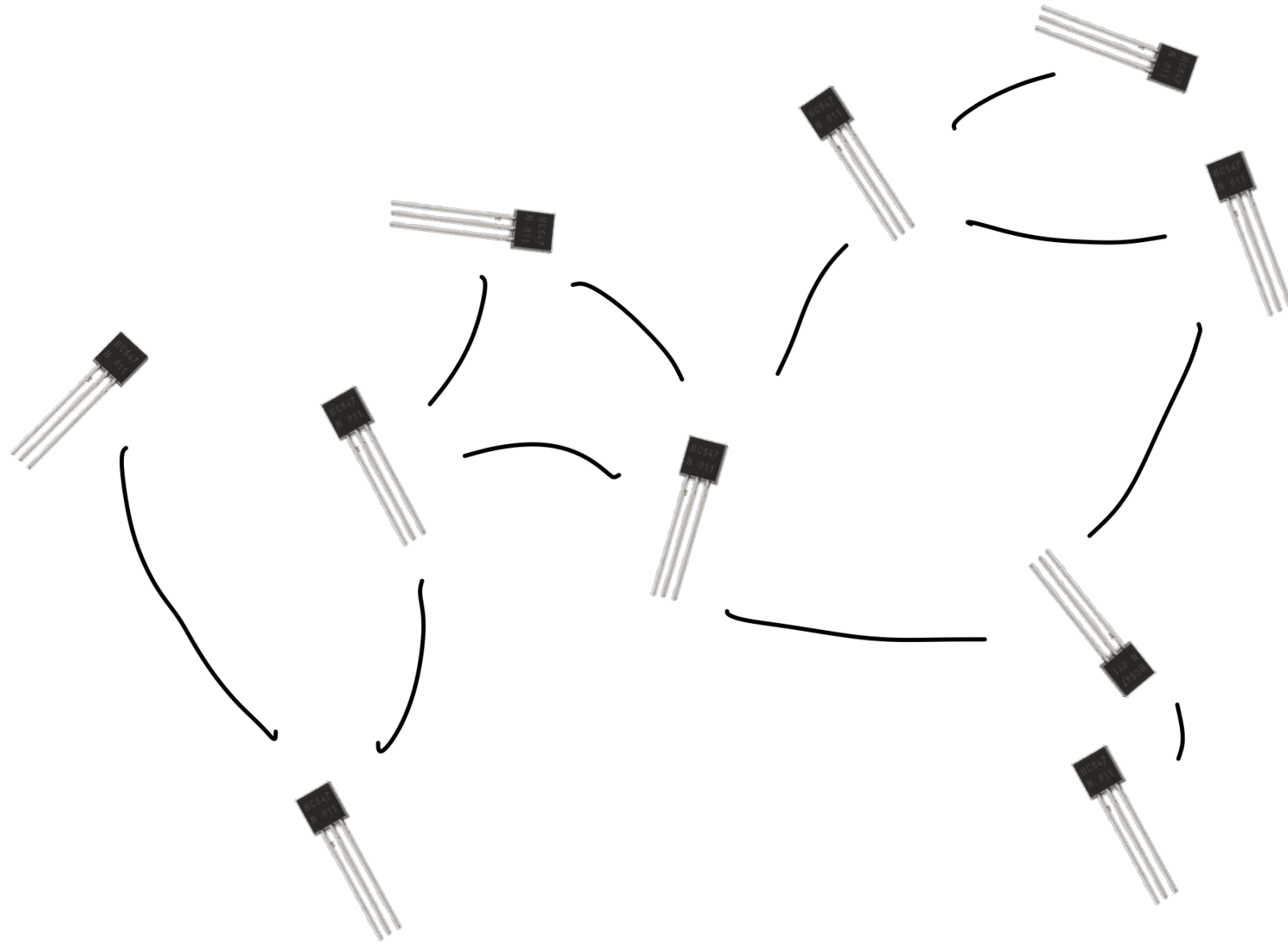
Cornell

# What is an FPGA?

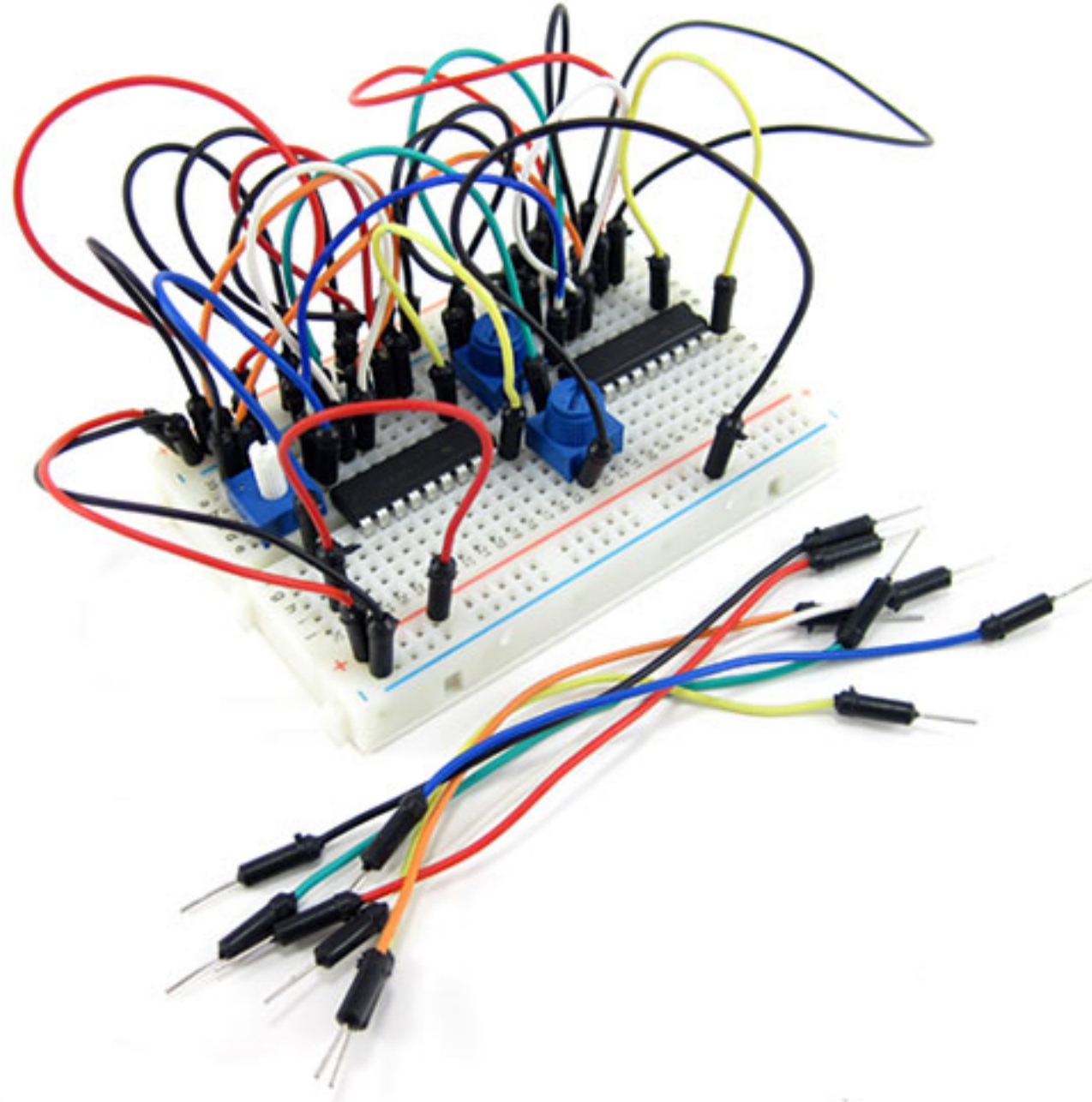
# What is an FPGA?



# What is an FPGA?



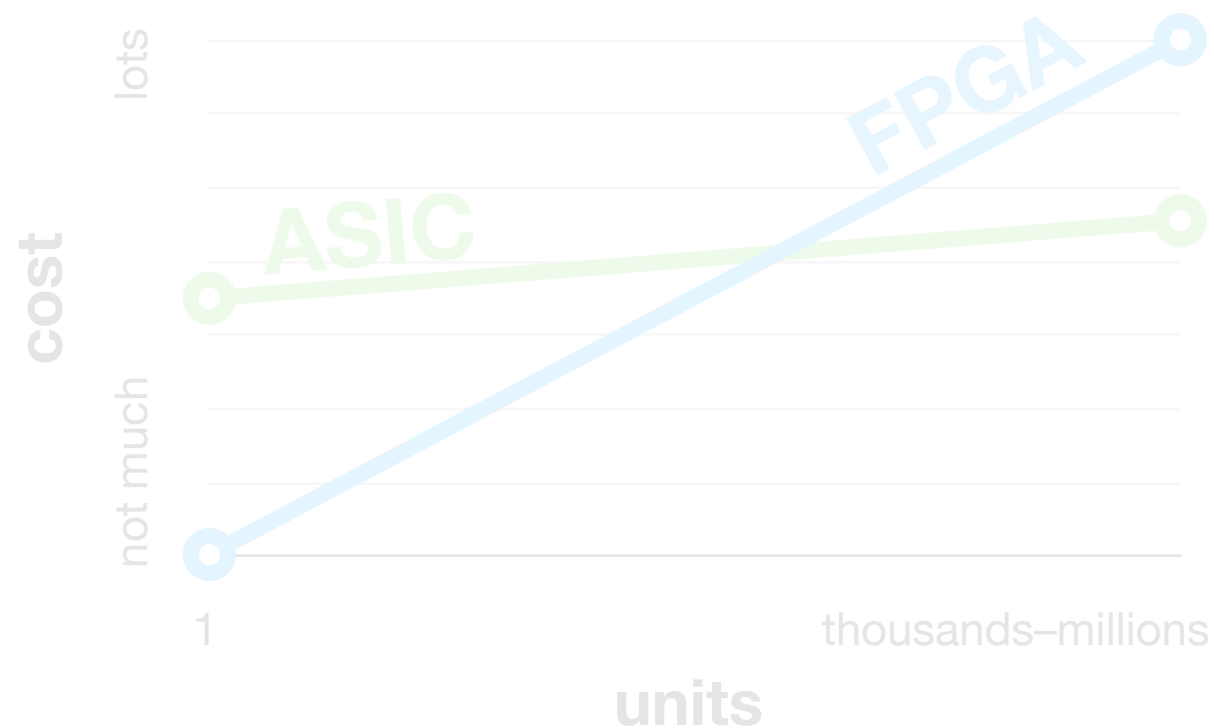
# What is an FPGA?



# What is an FPGA?

## A circuit emulator.

To prototype or replace an ASIC.



signal processing

VLSI validation

networking

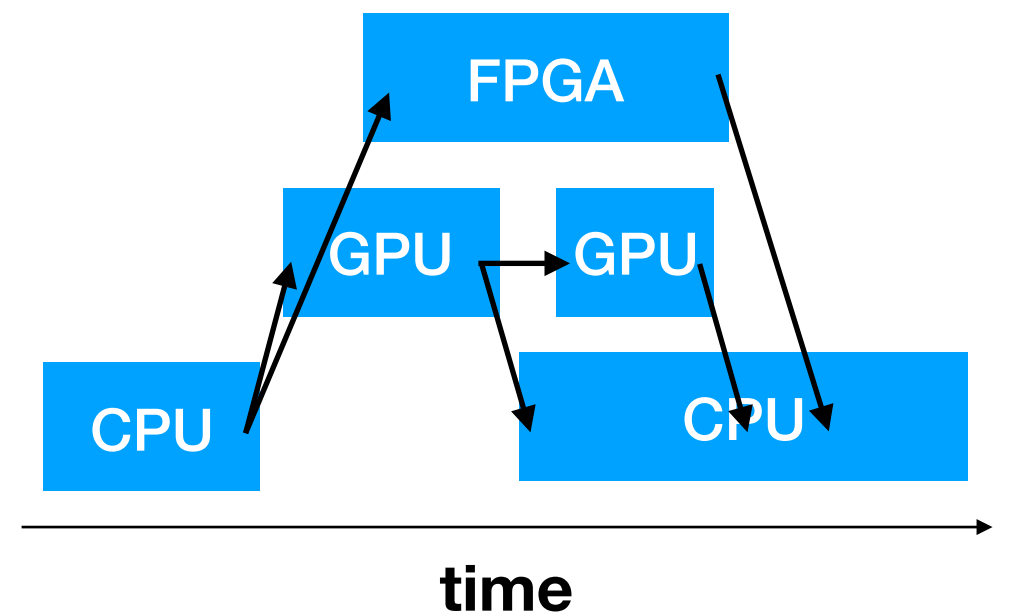
radio

embedded devices

microcontrollers

## A general accelerator.

To offload computation from a CPU.



machine learning

graph analytics

signal processing

genomics

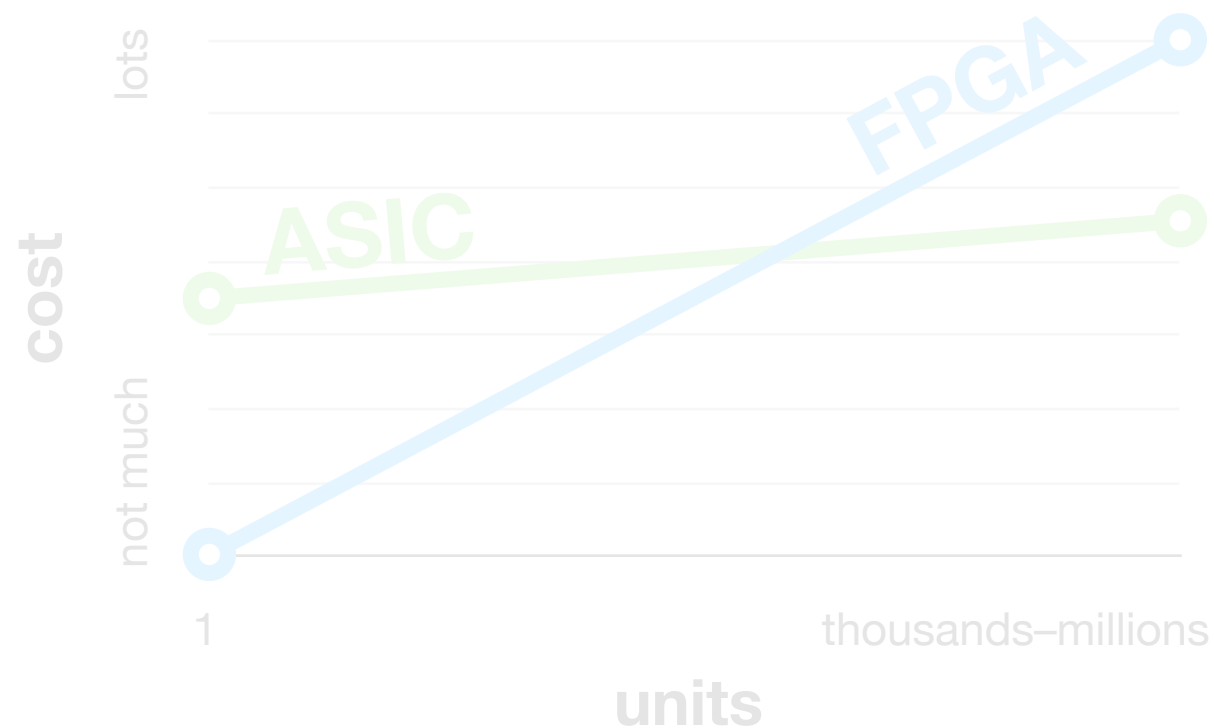
search

scientific computing

# What is a **computational** FPGA?

## A circuit emulator.

To prototype or replace an ASIC.



signal processing

VLSI validation

networking

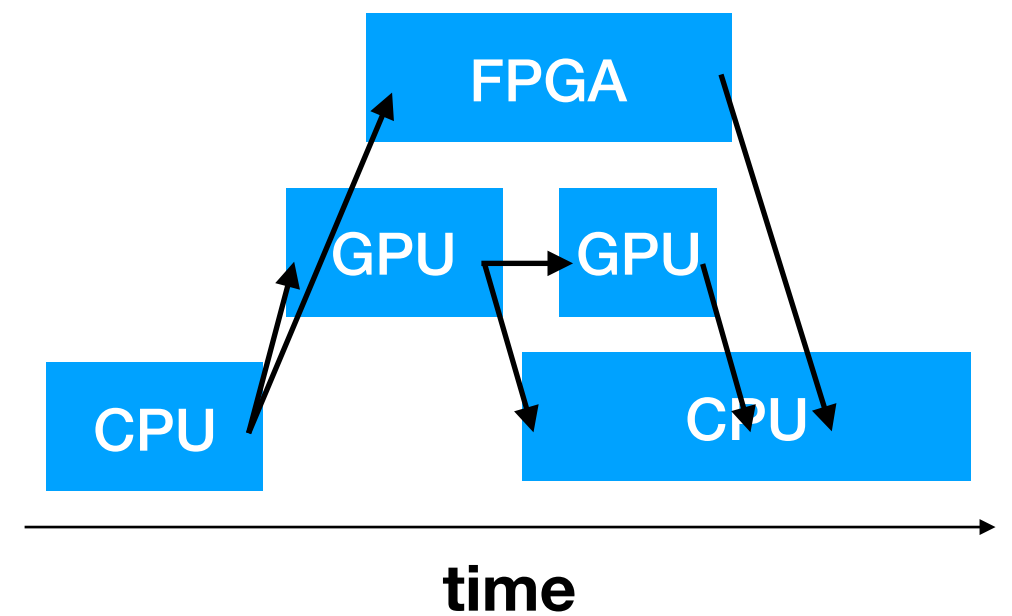
radio

embedded devices

microcontrollers

## A general accelerator.

To offload computation from a CPU.



machine learning

graph analytics

signal processing

genomics

search

scientific computing

COMPUTATIONAL

^

FPGAs Have the Wrong Abstraction

Adrian Sampson

Cornell



GPU : graphics :: FPGA : circuit simulation

**GPU** : massive, mostly regular  
data parallelism :: **FPGA** : potentially irregular,  
fine-grained parallelism  
with static structure

GPU : SIMT ISA :: FPGA : \_\_\_\_\_

GPU : SIMT ISA :: FPGA : ~~VERILOG~~

abstraction level



Excel

JavaScript

Java

C

ISA

processor pipeline

Verilog?

Verilog?

LUTs

GPU : GPGPU :: FPGA : \_\_\_\_\_