

Oct 2011, Team meeting

# Millicomputing

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# Motivation

- Low power components to reduce energy consumption and cooling
- Millicomputing, computing in the milliwatt (Cockcroft 2007, Hamilton 2009)
- Mobile industry (Intel celebrated their 500 million CPU in 40 years, 3 billion ARM chips in 2009 alone)

# Situation

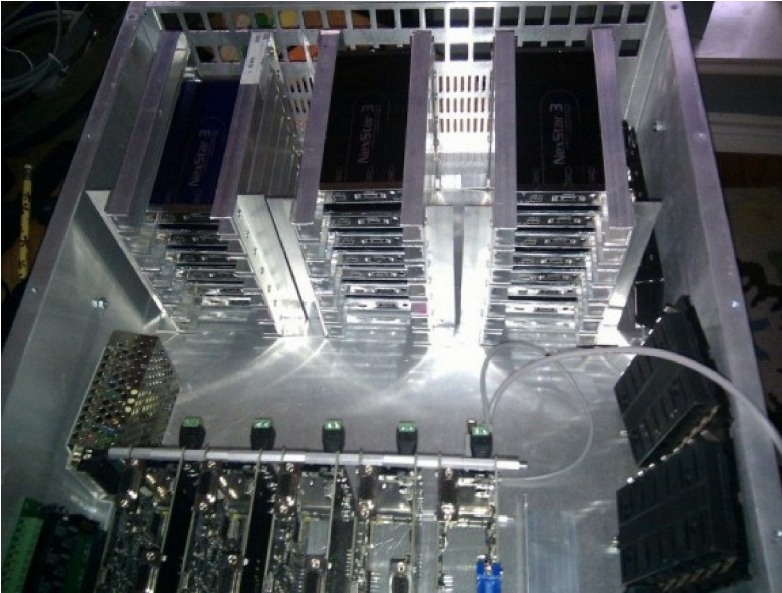
- ARM processor based machines improve energy efficiency (x4-10)
- Performance is an issue (x8-20)
- Millicluster
  - « 56% the throughput at 21% the cost and 13% the power » (Hamilton 2009)

# Product offering

- HP Redstone Server Development Platform (available in the first half of 2012)
  - 2,800 servers in a single rack
  - 89% less energy
  - 94% less space
  - 63% less cost
- Adhoc offers



# Panda board prototypes



- Canonical build farm
- Pandaboard cloud (OMAP4 @ 1GHz – 12 Cores) uses 4x times space and 5x less power (50W vs. 257 W) than a Xeon 1.8GHz Quad Core server with about the same amount of processing power and memory (6GB vs. 8GB)



# Applications

« Now that doesn't mean that you couldn't invent a problem that can't be done by ***a lot of slow processors working together***. It turns out that such problems are surprisingly hard to invent. [...]

It's very hard to find a problem that doesn't grow at least proportionately with the amount of data. The only problems that don't run well on a parallel machine are ***problems that just have a small fixed amount of data***.

For example, if you simulate the motion of the nine planets of the solar system, you can represent that with eighteen numbers. It's hard to see how you would use a whole lot of parallelism with only nine or even a hundred planets. »

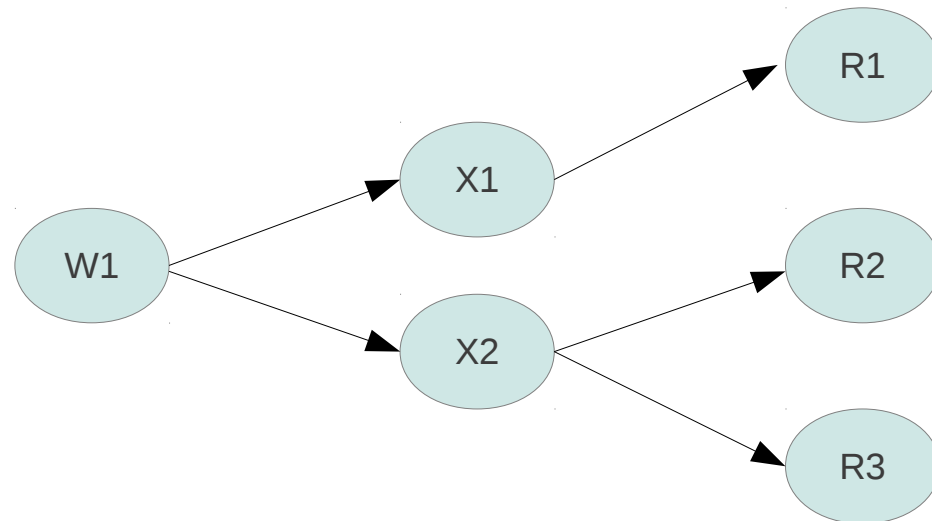
D. Hillis

# Target applications

- Small sequential programs
- Reactive systems (network)
  - Stream (sequence) of small program calls

# Sources of parallelism

- Functional equivalence
- Space/time tradeoff :
  - Caching
  - Prefetching
- Scalability ?





Thank you

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