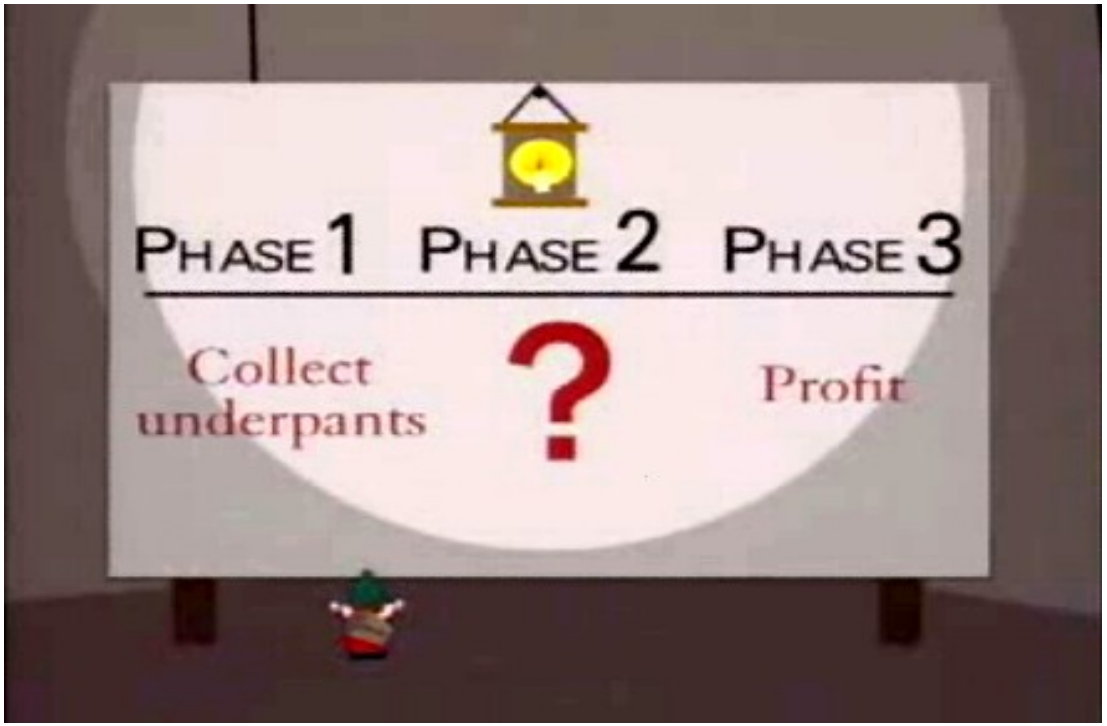
Is there a business case for a low power cloud?

1. build a cloud from lots of ~~underpants~~ mobile phone CPUs

2. ?

3. Profit



A lot of talk about performance per watt, low power computing, ARM, MIPS servers

A lot of crap talked about how you will just get more servers and it will be "as fast"

We know that scale out is not trivial.

Will they replace what we have?

What will they look like?

Will they perform?

What kinds of problem will they be good for?

Some numbers

	RAM	power	cost	SHA1 speed
dual core 1GHz ARM	1 GB	4 W	$50	120 MB/s
dual core Pentium	8 GB	40 W	$500	720 MB/s
12 core Xeon	64 GB	400 W	$5000	3000 MB/s

Well that's not going to sell. We all know that 100 tiny boxes are not going to deliver the same performance as one big one (Amdahl's Law), and there is really nothing in it power, memory, performance or cost wise.

Of course there is utilisation. But virtualization has solved that issue.

Upside?

Bandwidth limited applications

Dual core 1GHz ARM can run SHA1 at gigabit ethernet line speed. Cloud providers currently mostly running gigabit to the server at the moment.

So for storage type applications (eg S3) it might make sense, if it is cheaper than moving to 10GbE.

Bit on the tail end of network cycle, as 10GbE will be shipping in volume and much cheaper when low power servers do.

BUT still the case that for bandwidth limited processes, 1GbE to 10GbE is only a factor of 10 not 100. 10 x low power ARM might be competitive.

Best case 1 order of magnitude cheaper for same bandwidth

RAM based world

The applications we are building are very RAM hungry.

RAM based NoSQL databases: Memcache, Redis, Membase, VoltDB, Gigaspaces, ...

Heavy use of RAM caching in web architectures.

EC2 offers 68GB high memory instances.

16GB DIMMs available.

Intel releasing machines that can take 1TB RAM.

ARM servers under development are 32 bit. How quaint. 4GB should be enough for anybody.

Why are we some RAM obsessed?

L1 cache reference	2,000,000,000
Branch mispredict	200,000,000
L2 cache reference	140,000,000
Mutex lock/unlock	10,000,000
RAM reference	10,000,000
datacentre round trip	2000
hard drive seek	100
Intercontinental round trip	10

Hold on, something happened...

Reads per second

L1 cache reference	2,000,000,000
Branch mispredict	200,000,000
L2 cache reference	140,000,000
Mutex lock/unlock	10,000,000
RAM reference	10,000,000
SLC flash SSD, PCIe	180,000
MLC flash SSD, SATA	35,000
datacentre round trip	2000
hard drive seek	100
Intercontinental round trip	10

What does this mean?

For workloads that do not involve reading huge amounts of data, or seeking a huge number of times per request, we can serve 1k-10k request per second from SSD rather than out of RAM. Gigabit ethernet with 8k responses is bandwidth limited to 12,000 responses a second.

Eg SAAS web application, each customer has 1GB data that must be available fast for querying.

Best case 2 orders of magnitude cheaper...

12 core xeon	64 GB RAM	$5,000	64 customers	$78 each	400 W
2 core ARM	256 GB SSD	$1,000	512 customers	$2 each	4 W

Is there a business case for a low power cloud?

1. Doing the same thing with small low power boxes is less efficient - think different

2. Low power computing will not replace what we have now
3. It does not suit all applications, but enough for a market
4. We cannot use the current breed of applications for RAM heavy software

5. SSD replaces RAM - slower, but fast enough
6. GbE is well suited for low cost SoC
7. Aim for 1-10k request per second applications, eg multitenant web applications

8. Software needs low memory footprint as there isn't much
9. Software needs to be efficient, as every cycle counts

10. 1-2 orders of magnitude cheaper is a business opportunity

Questions?

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