Benchmarking Web Applications and Frameworks

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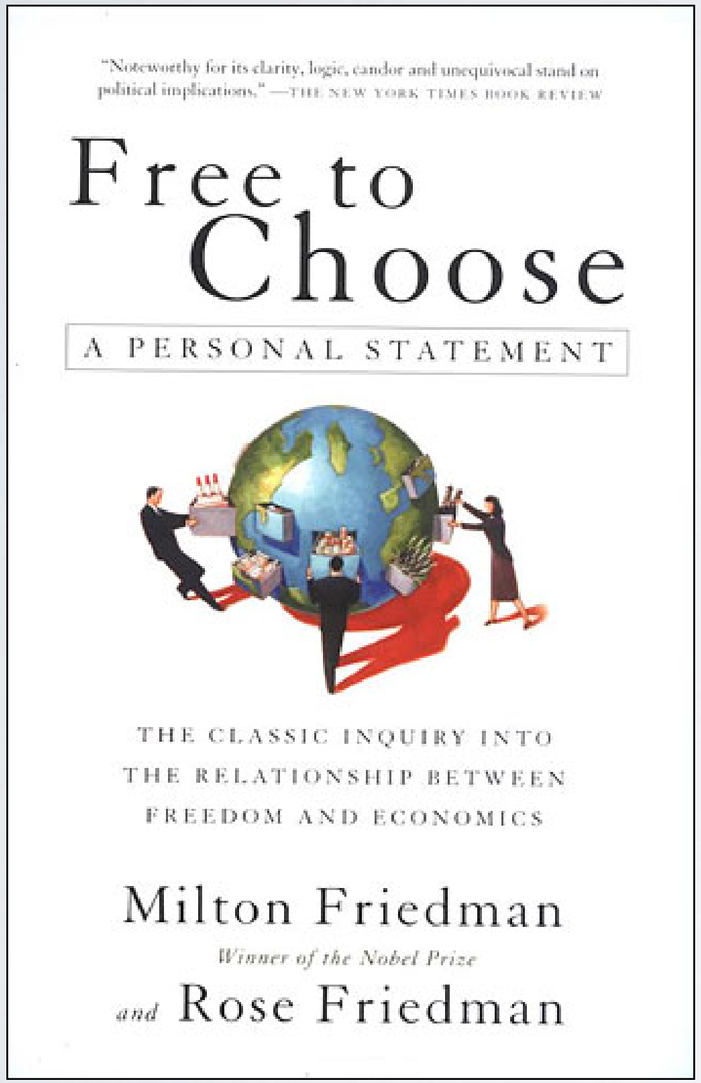
http://joind.in/3741

Overview

- Benchmarking methodology, results, and interpretation
- Resource usage prediction
- Engineering analysis
- Framework comparisons

Read These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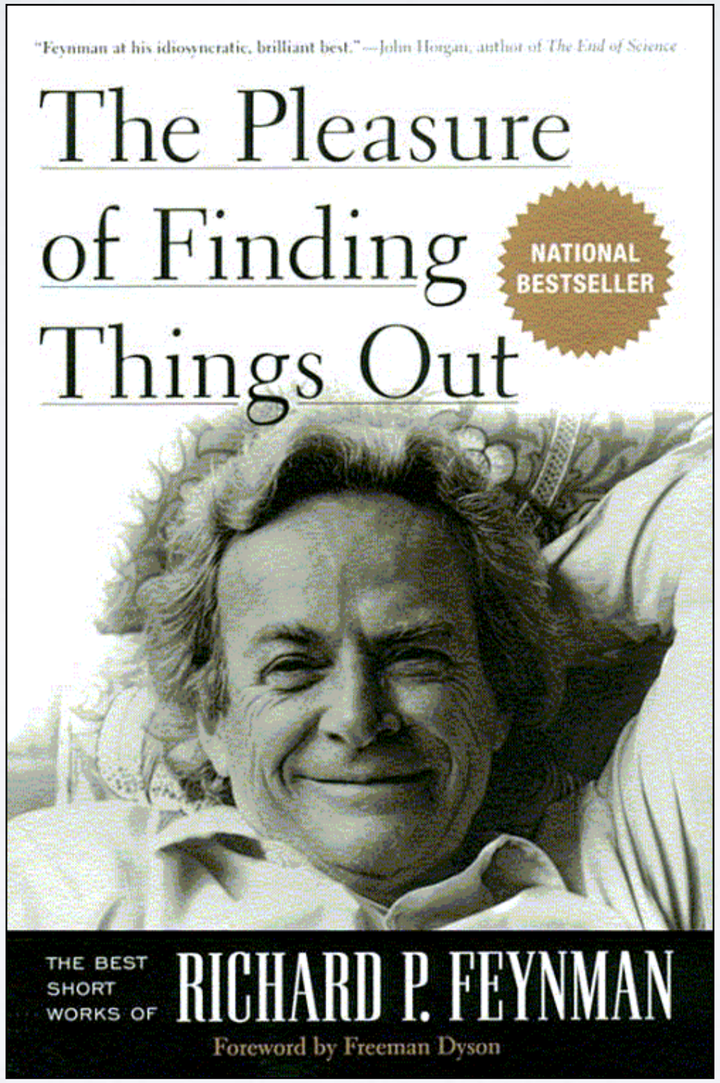
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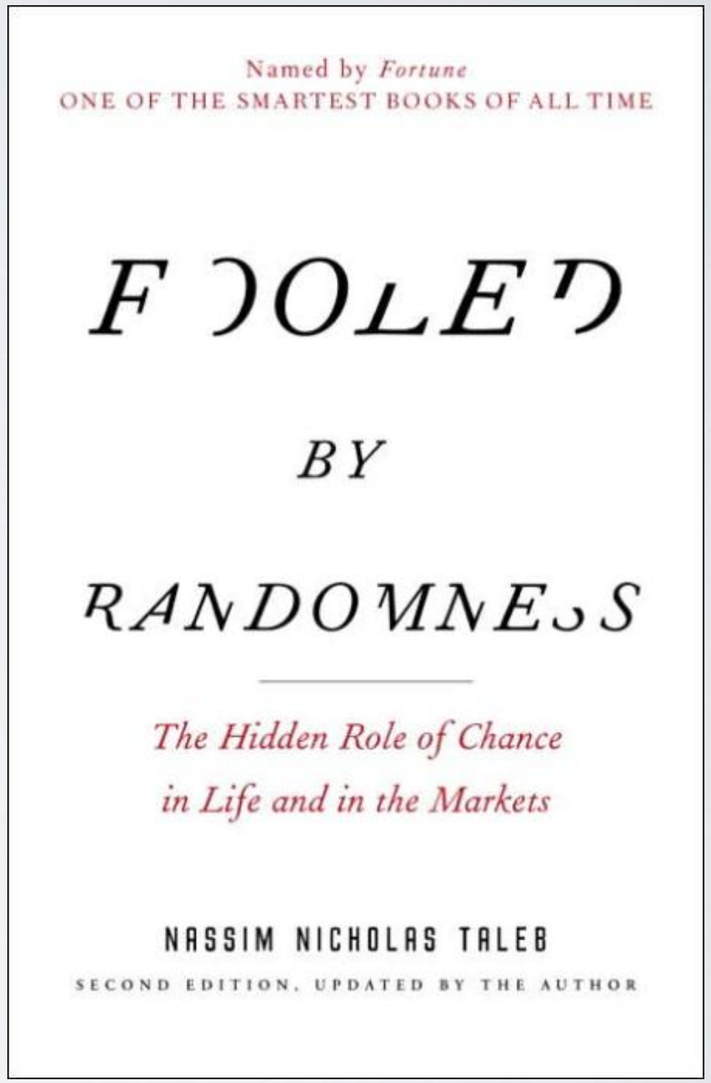
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The Hidden Role of Chance in Life and in the Markets
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SECOND EDITION, UPDATED BY THE AUTHOR

About Me

- Developer, Senior Developer, Team Lead, Architect, VP Engineering
- Military, education, non-profit, startups, products, consulting
- SpikeTV, MTV, Facebook, Microsoft, Apple, etc.
- ZCE Education Advisory Board
- PHP since 1999

Full Disclosure

- solarphp.com
- framework.zend.com
- auraphp.github.com
- “Rigor and integrity”
- github.com/pmjones

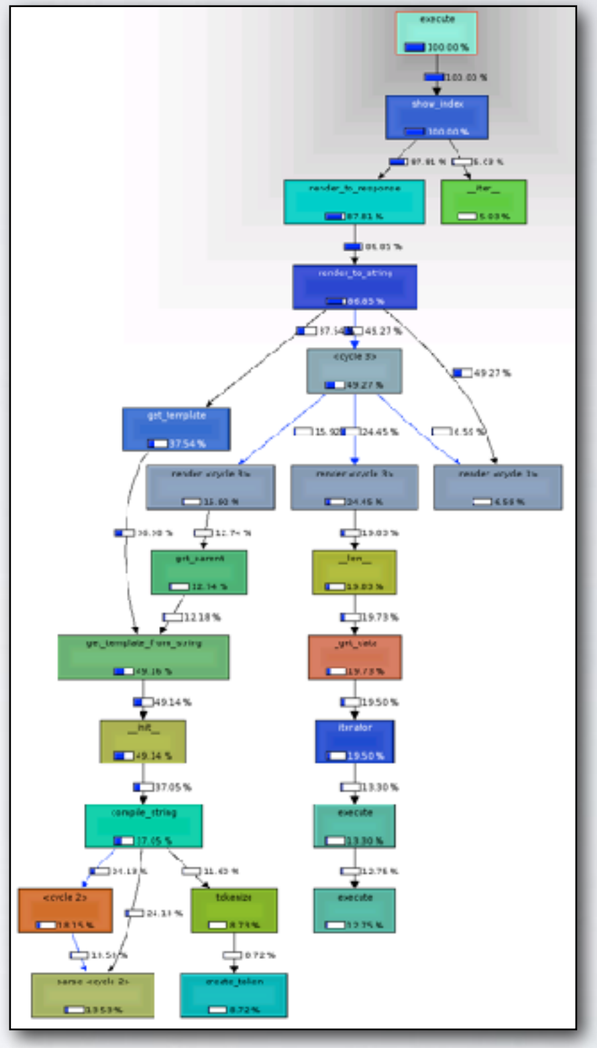
Part 1:
In General

Profiling vs Benchmarking

- Profiling applies to sub-systems (component design)

- Benchmarking applies to entire systems (architecture and interaction)

- Profiling is to unit testing, as benchmarking is to system testing



Benchmarking Subjects

- CPU
- RAM
- Disk access
- Database access
- Network access
- **Requests/second**

- Programmer productivity
- Time to initial implementation
- Time to add new major feature
- Time to fix bugs

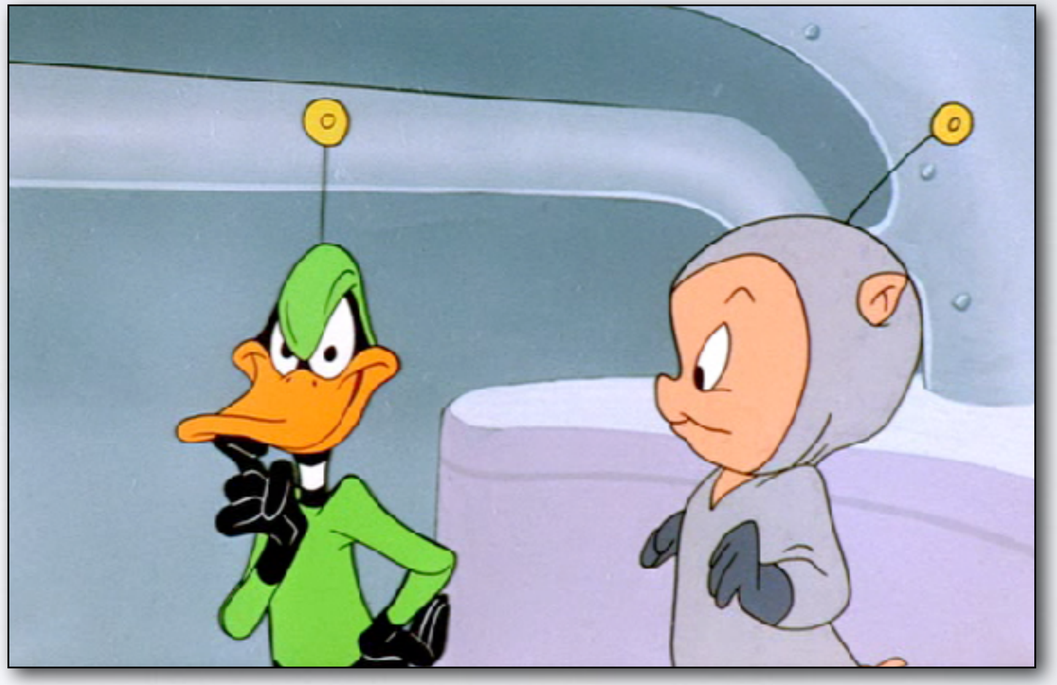
-- numeric measurement --
-- control for variables --

Why Bother With Benchmarking?

- New site will be submitted to Slashdot, Digg, etc.
- "Can we handle the traffic, Dodgers?"
- "Sure thing, boss."

Why Bother With Benchmarking?

- "...(time to load-test.)"
- How many req/sec to expect?
- Load-test, optimize, balance ...
- ... in a hurry, in the blind.



Luck and Limitations

- Do you feel lucky?
- What limits are imposed, and where?
- Where in the stack to expend effort?

Part 2:
Getting Started

Benchmarking Methodology

- Refining and reporting since 2007
- Benchmark the basic system
- Add a component, benchmark again
- Track responsiveness at each point

Benchmarking Tools

- ab, http_load, siege, ...
- Emulate concurrent users hitting a URL
- Reports req/sec, latency, min/max times, etc

```
ab -c 10 -t 60 http://example.com/foo/bar
```

Combined Tooling

- Each tool (ab, http_load, siege) has different options, params, and target specifications
  - github.com/pmjones/php-framework-benchmarks

```
./bench/(ab|http_load|siege) target/all.ini
```

Target Server Setup

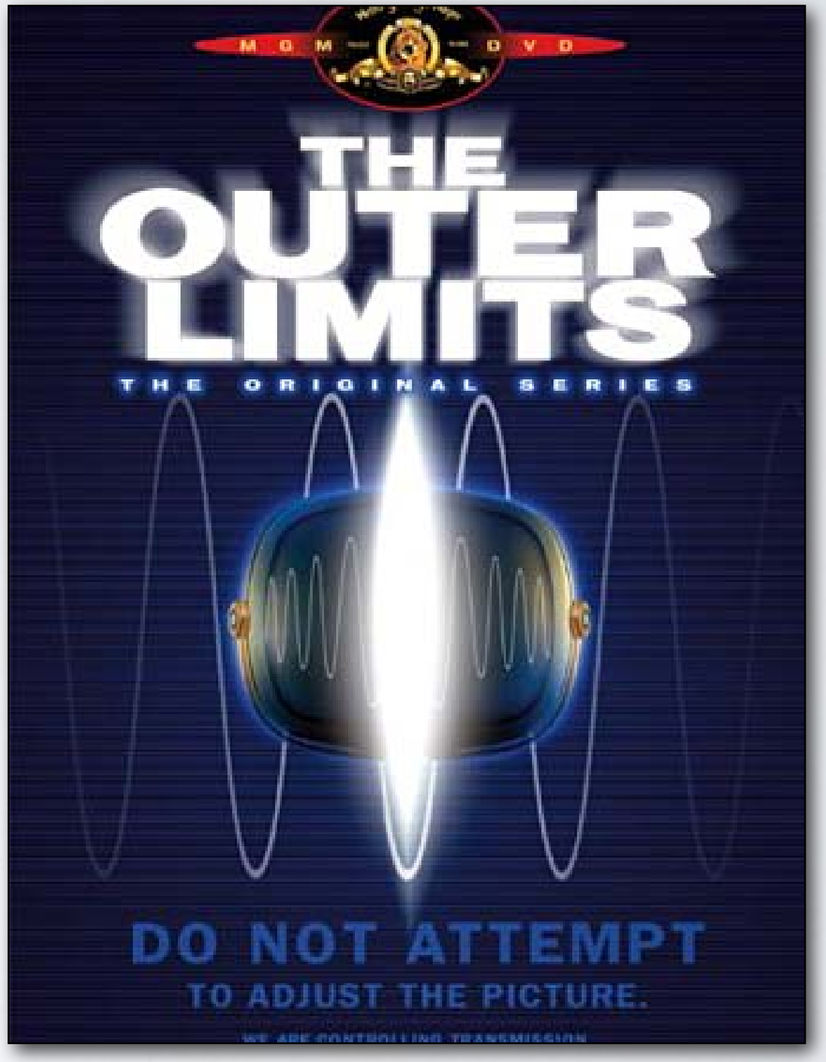
- Run against a test installation
- As similar to production as possible
- Hardware, OS, server, language version
- No framework or application code

Control for Known Variables

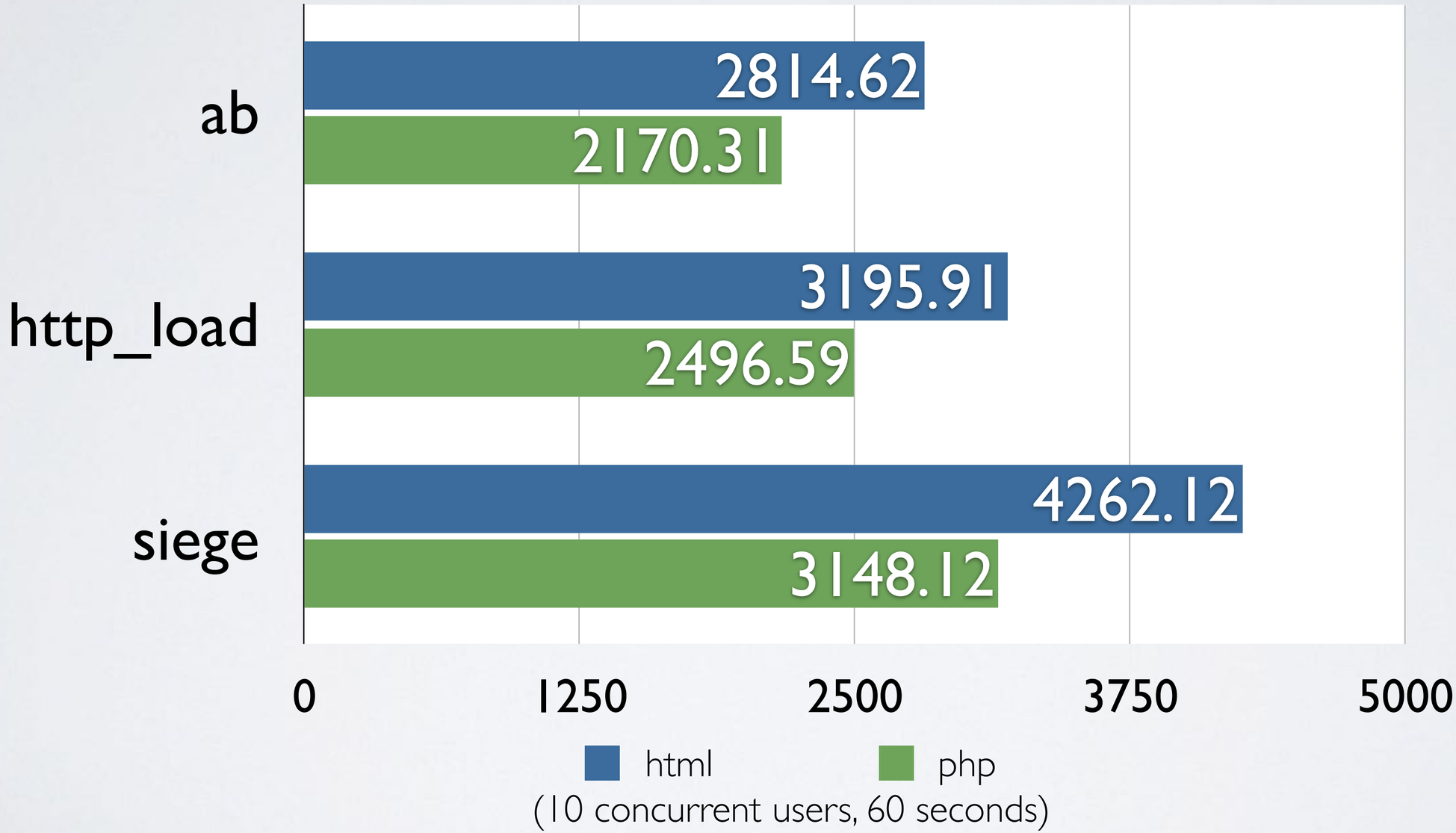
- Network latency
- Server processes

Outer Limits Of Responsiveness

- Amazon EC2 “Large” instance, 64-Bit Ubuntu 10.10 (Alestic)
- Apache 2.2 (stock install)
- PHP 5.3.3, APC, Suhosin (stock install)
- static index.html:
  `Hello World!`
- dynamic index.php:
  `<?php echo ‘Hello World!’; ?>`



Static and Dynamic Graph

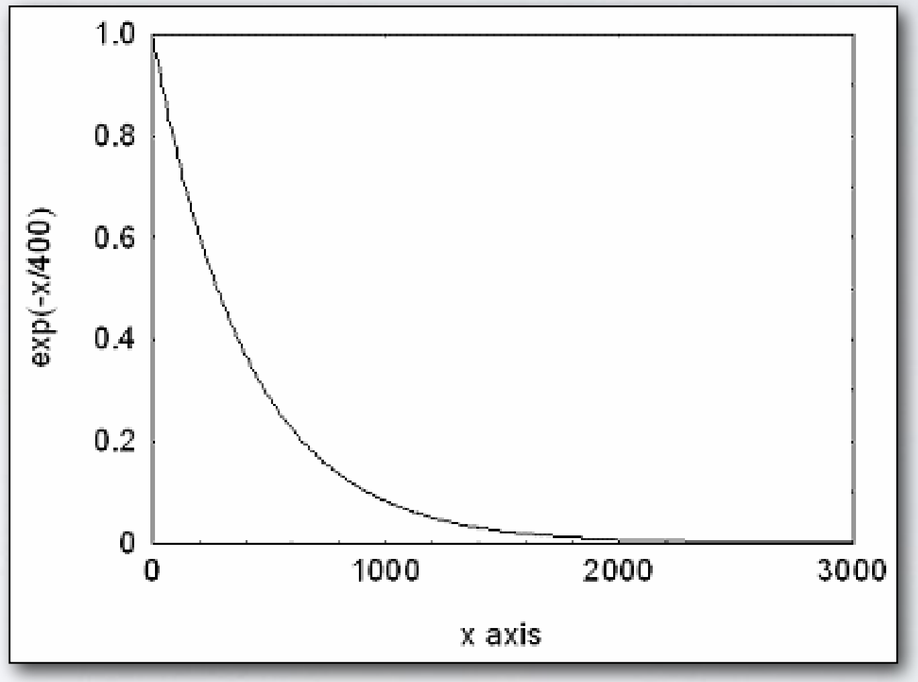


HTML and PHP Percentage Change

	html	php	pct
ab	2814.62	2170.31	77.11%
http_load	3195.91	2496.59	78.12%
siege	4262.12	3148.12	73.86%

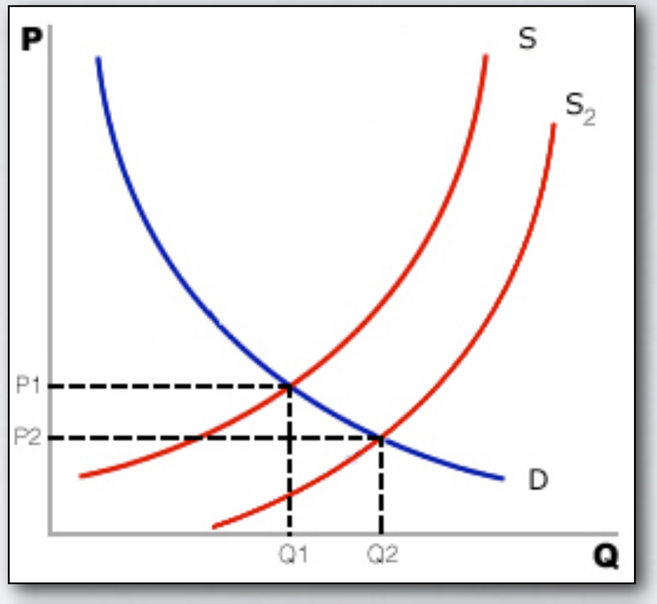
Control for Unknown Variables

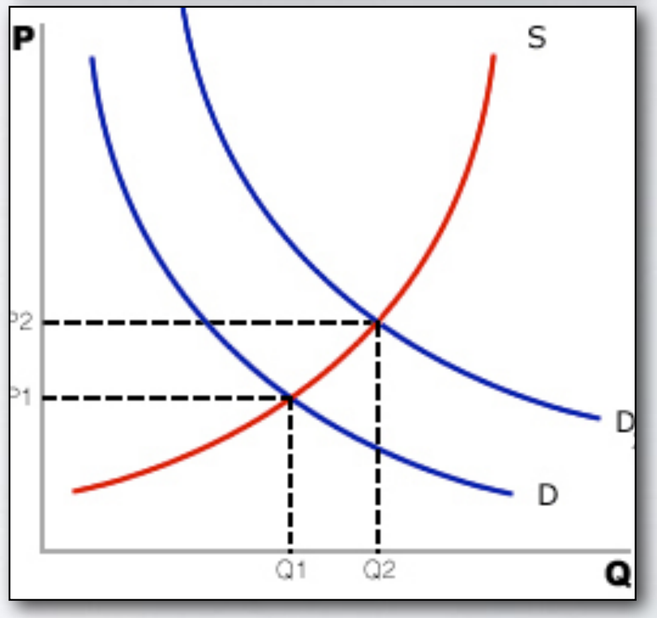
- Run multiple times
- No two runs will be identical; look for trends



Benchmarking as Resource Prediction

- About resource planning, not speed
- With a supply of "R" requests/second, you need "S" servers for demand of "T" traffic
- What stack components can you modify to increase "R" so you can handle more "T" with same or fewer "S"?



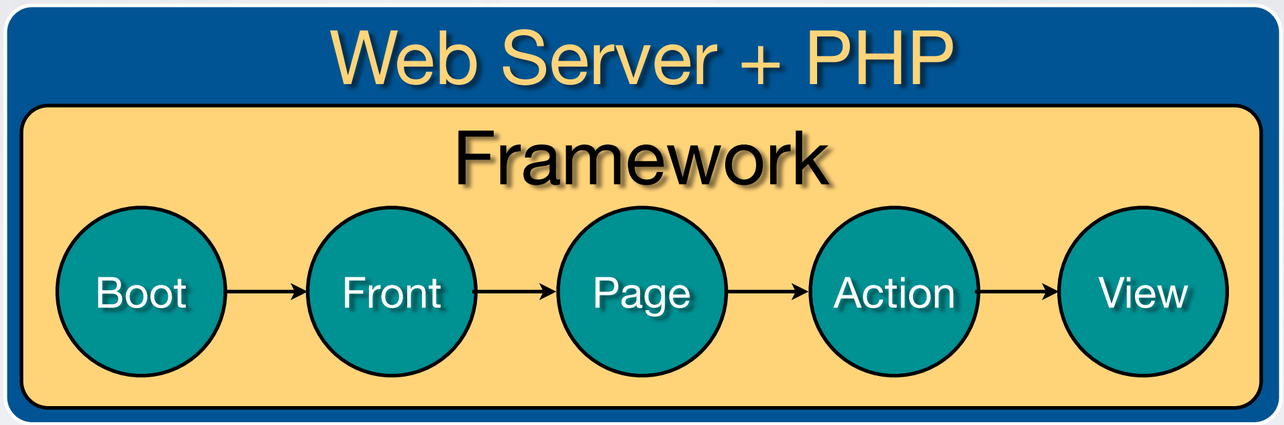


Part 3:
Single Framework

Single-Framework Methodology

- Minimal application
- Sane config
- No action code
- No view layout or helpers
- Static view text ("Hello World!")
- No page caching

Framework Benchmarking



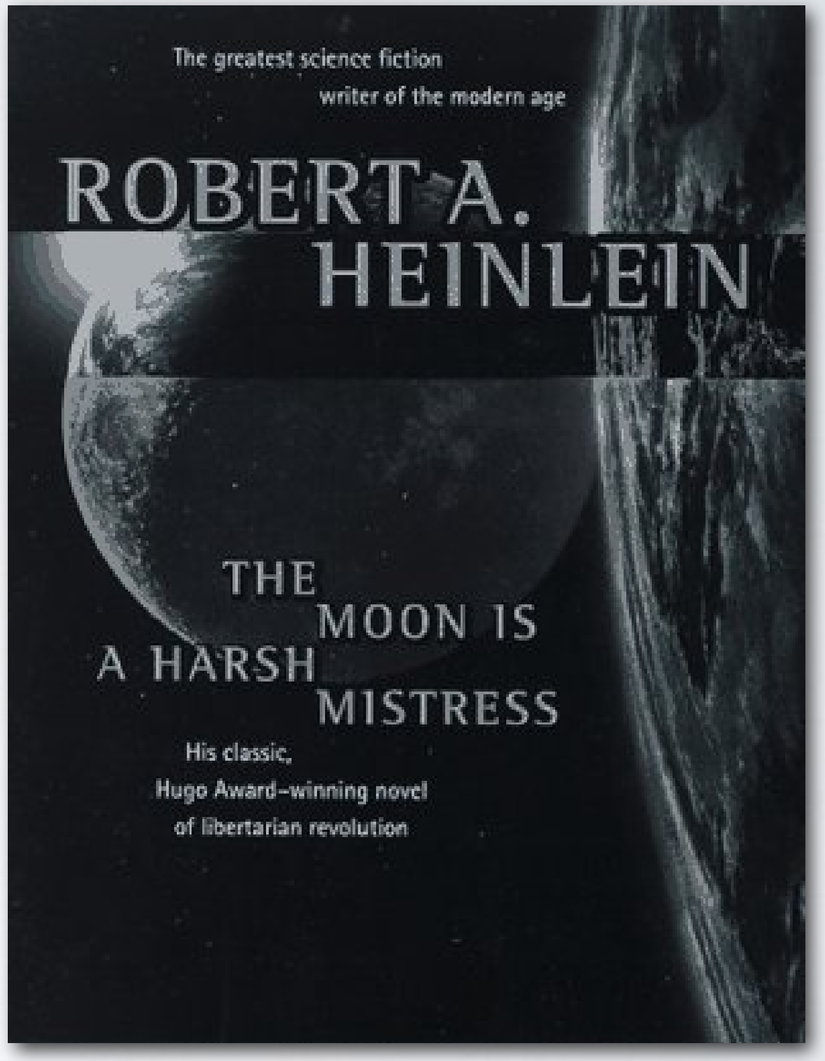
- Dynamic dispatch cycle as the limiting factor
- Improvements off critical path not likely to increase responsiveness
- “What about page caching?”

Single-Framework Analysis

- Benchmark static, dynamic, and framework (minimal application)
- Now you know limits on each
- Iterative benchmarking

Benchmarking as Engineering Aid

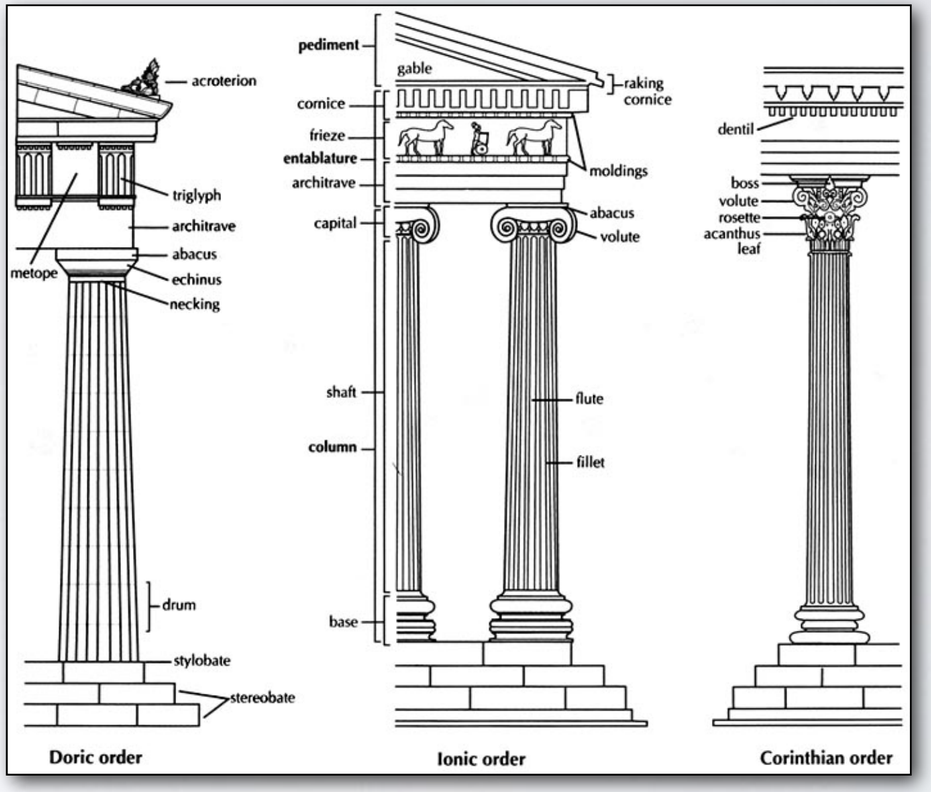
- Every architecture decision has a cost
- Compare stats between versions
- Are added features worth req/sec cost?
- (Thanks, Laura Thomson.)



Part 3:
Multiple Frameworks

Multiple-Framework Comparison

- Examine responsiveness in context of other systems
- Compare architecture costs between systems
- Use the same minimal app to remove variability in app code



Compare Like With Like

- Frameworks to be compared should be reasonably similar in approach

- PHP5, design patterns, front & page controllers, controller & view separation, plugins or extensions, no globals

- Aura, Cake, Lithium, Solar, Symfony, Zend

- CI, Kohana

Multiple-Framework Methodology

- Minimal application
- Reduced or optimized config
- Production mode
- No debugging or logging
- No database connection
- No layouts or view helpers

Multiple-Framework Methodology

- APC to reduce filesystem access
- Restart web server between runs (APC)
- 5 runs of 10 concurrent users for 60 seconds
- Average, then calculate req/sec as percent of PHP (thanks, Richard "Cyberlot" Thomas)

Framework Numbers

Target	*relative*	*average*	*1*	*2*	*3*	*4*	*5*
baseline/html	1.2669	2915.01	2935.71	2928.76	2864	2922.95	2923.63
baseline/php	1	2300.95	2316.01	2298.45	2306.55	2290.59	2293.13
aura/dev	0.1082	248.9	263.15	249.3	260.73	236.47	234.86
aura/dev-cached	0.1327	305.37	313.35	310.42	294.89	287.53	320.65
cake/1.3.10	0.1141	262.58	257.2	264.4	269.24	264.51	257.55
ci/1.7.3	0.313	720.16	717.63	729.75	706.64	723.17	723.61
ci/2.0.2	0.2637	606.78	629.07	589.96	636.2	575.59	603.06
kohana/3.1.3.1	0.2433	559.74	576.89	541.47	551.59	567.14	561.6
lithium/0.9.9	0.1077	247.75	264.83	211.66	272.27	201.67	288.32
solar/1.1.1	0.1682	387.13	403.42	382.57	362.32	398.34	388.98
symfony/1.4.8	0.1011	232.66	238.56	227.17	231.23	231.77	234.59
symfony/2.0.4	0.074	170.3	170.35	170.55	170.25	169.67	170.67
symfony/2.0.4-fp	0.1601	368.44	369.87	349.32	372.84	362.68	387.48
zend/1.10.2-minapp	0.1426	328.12	325.37	322.02	322.1	337.54	333.56
zend/1.10.2-project	0.1039	239.12	241.07	239.5	238.25	237.06	239.73
zend/1.11.9	0.1024	235.61	244.65	235.82	228.65	235.84	233.07
zend/2.0.0beta1	0.0554	127.55	127.28	127.75	127.23	127.62	127.88

Framework Numbers

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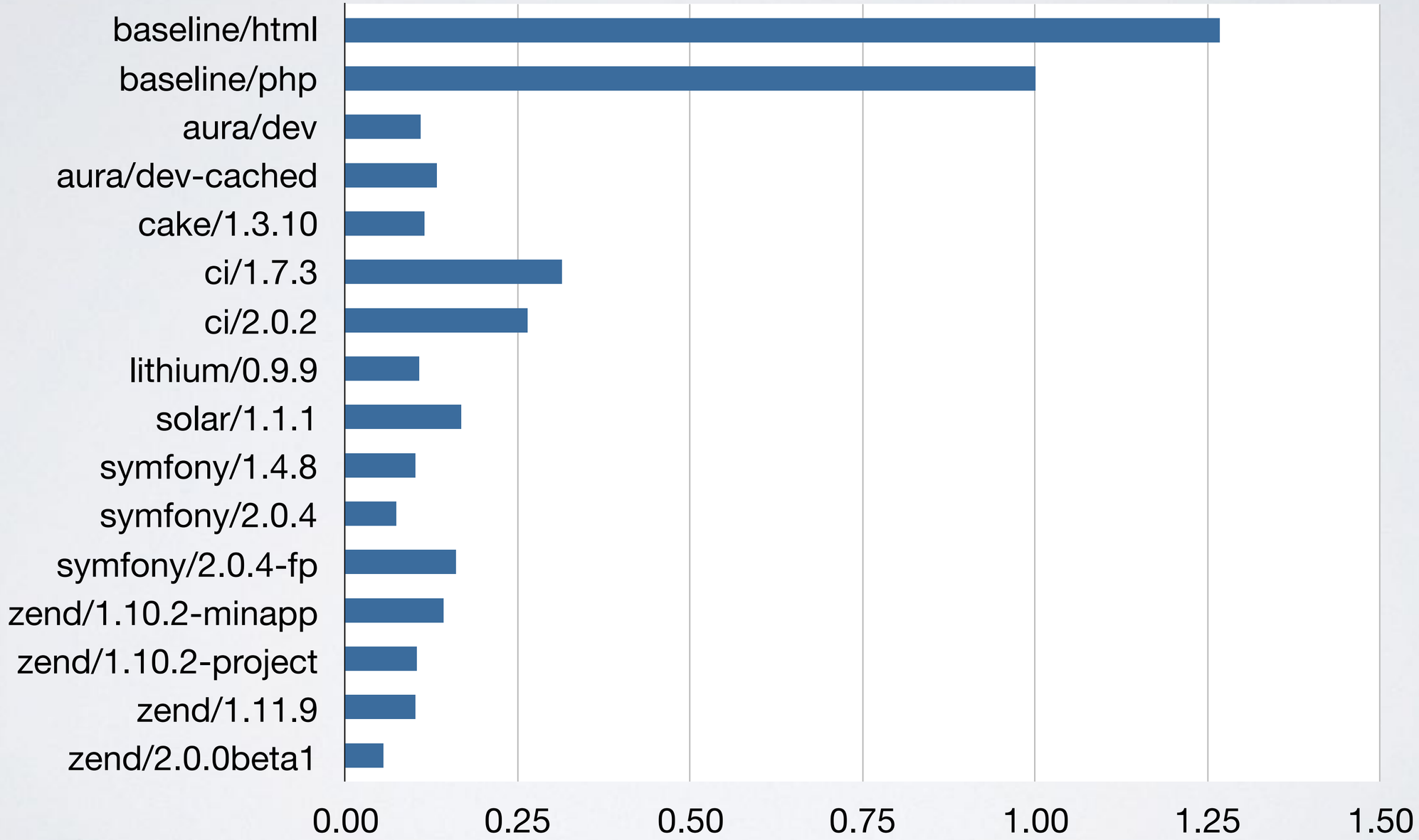
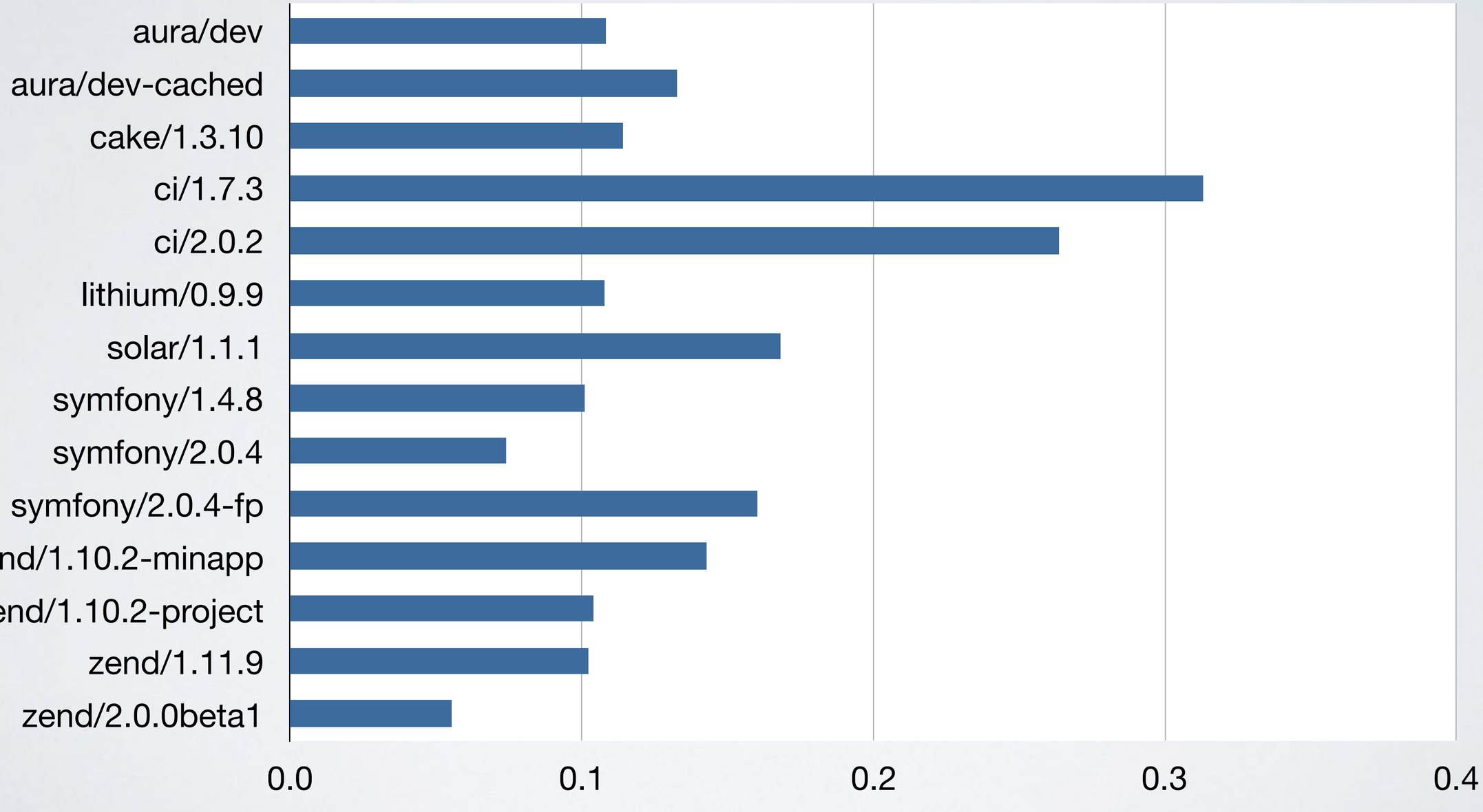
Framework Graph (100%)



Framework Graph (40%)



What Does This Mean?

- No such thing as “fast” or “slow”
- “Proves” nothing
- Unlikely to change minds of devotees
- Resource usage, engineering aid
- Even the slowest is still pretty fast
- Each AJAX call is one request

Failure Modes

- Incorrect setup (aka “I got it wrong”)
  - Apache/Lighty, APC/XCache, mod_php/fcgid
  - Different concurrency or duration
  - Added features and app code will reduce dynamic response ... but curve is unknown.

Links

- github.com/pmjones/php-framework-benchmarks
- New Year's Benchmarks: paul-m-jones.com/archives/238
- Do All Frameworks Really Suck?: laurathomson.com/2007/07/do-all-frameworks-really-suck
- Google: "cargo cult science"

- Questions?
- Comments?
- Criticism?

Thanks!

- paul-m-jones.com
- slideshare.net/pmjones88
- twitter.com/pmjones
- joind.in/3741

Bonus Slides!

Objections

- "Highly profiled."
- "'Hello world' is unrealistic."
- "Not optimized for 'hello world.'"
- "Faster for 'real world' applications."

Avoid Frameworks?

- If framework code is only at 4-30% of max PHP, should we not use frameworks?
- "Slow" relative to what?
- Compare like with like, and proposed systems to existing systems.
- You will use a framework, even if you write it yourself.
- The good comes not from the code or the features, but process standardization.

Thanks Again!

- paul-m-jones.com
- twitter.com/pmjones
- http://joind.in/3741