

# Sample Web Site Performance Tuning

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The logo for ipSpace, featuring the text "ipSpace" in a white, cursive script font. The logo is positioned in the lower right quadrant of the slide, overlaid on a background of diagonal stripes in various shades of orange, yellow, and brown.

## Short Summary

- Small Mediawiki site running in a small VM
- Simple tuning results in 2300-times better performance
- Mostly common-sense tuning
- Last step (boosting performance by a factor of 100) requires modification to 10 lines of PHP code

# Background Information

- LAMP application stack
- Mediawiki software
- Peak rate: ~1000 page views per hour

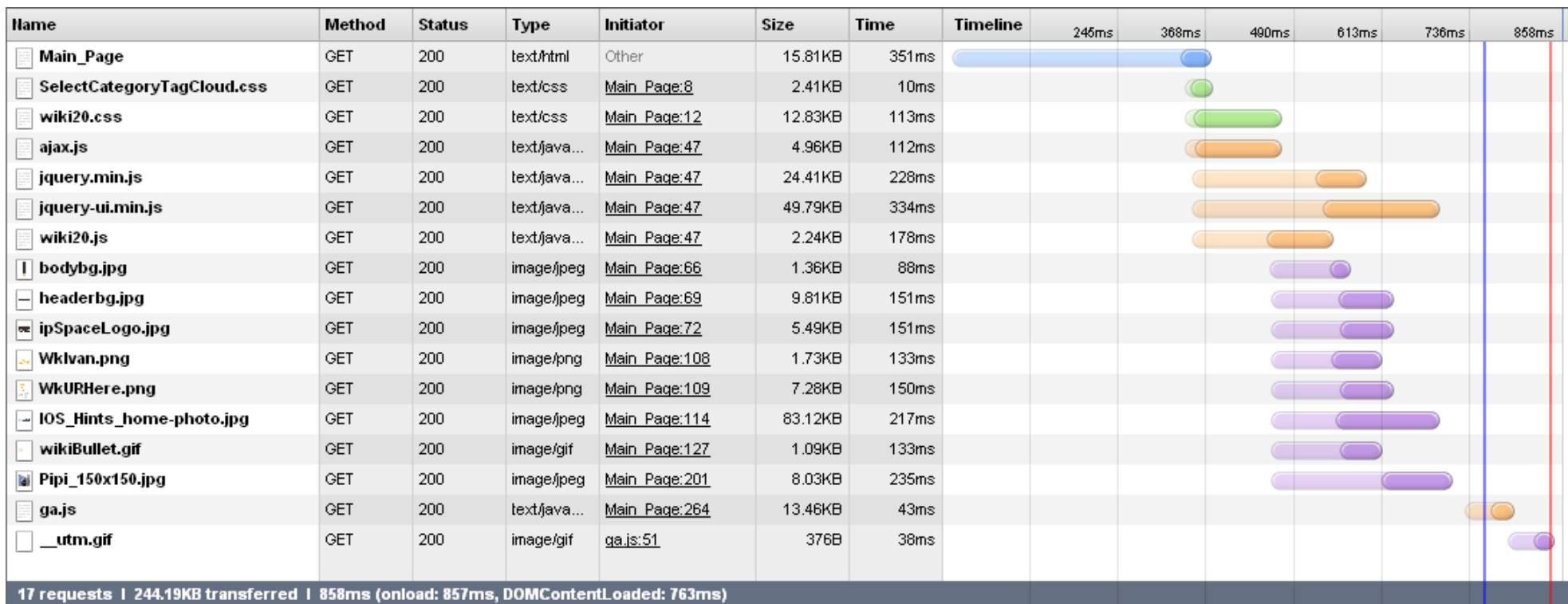
## Server performance

- Virtual machine with 2GB RAM, 1vCPU
- Approximately equivalent to Small EC2 Instance
- Peak CPU utilization during tests ~ 800 Mhz

## Testbed:

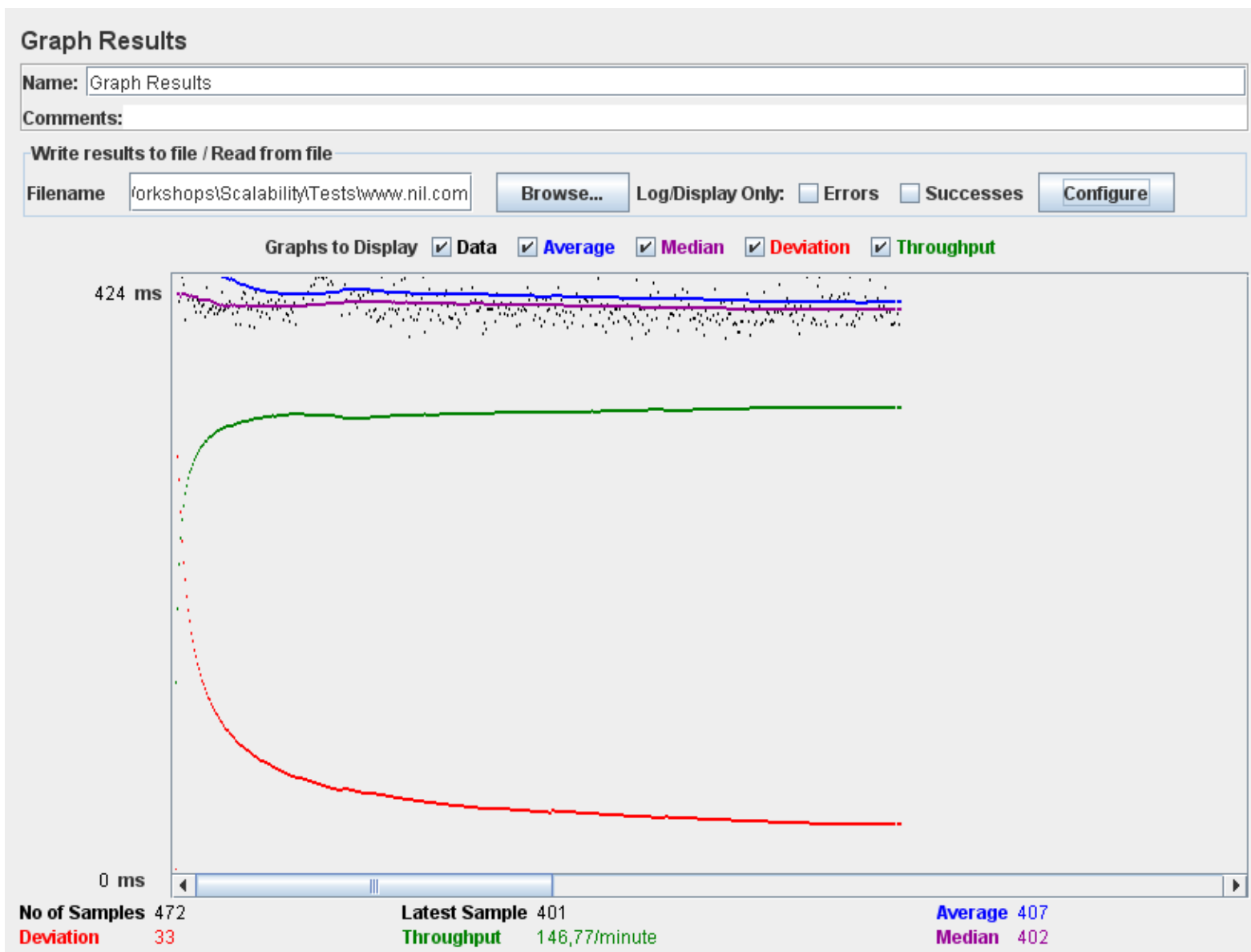
- Remote Apache jMeter
- 20 Mbps bandwidth between test site and web server
- ApacheBench run locally for high-performance test

# Baseline: Home Page From Idle Server

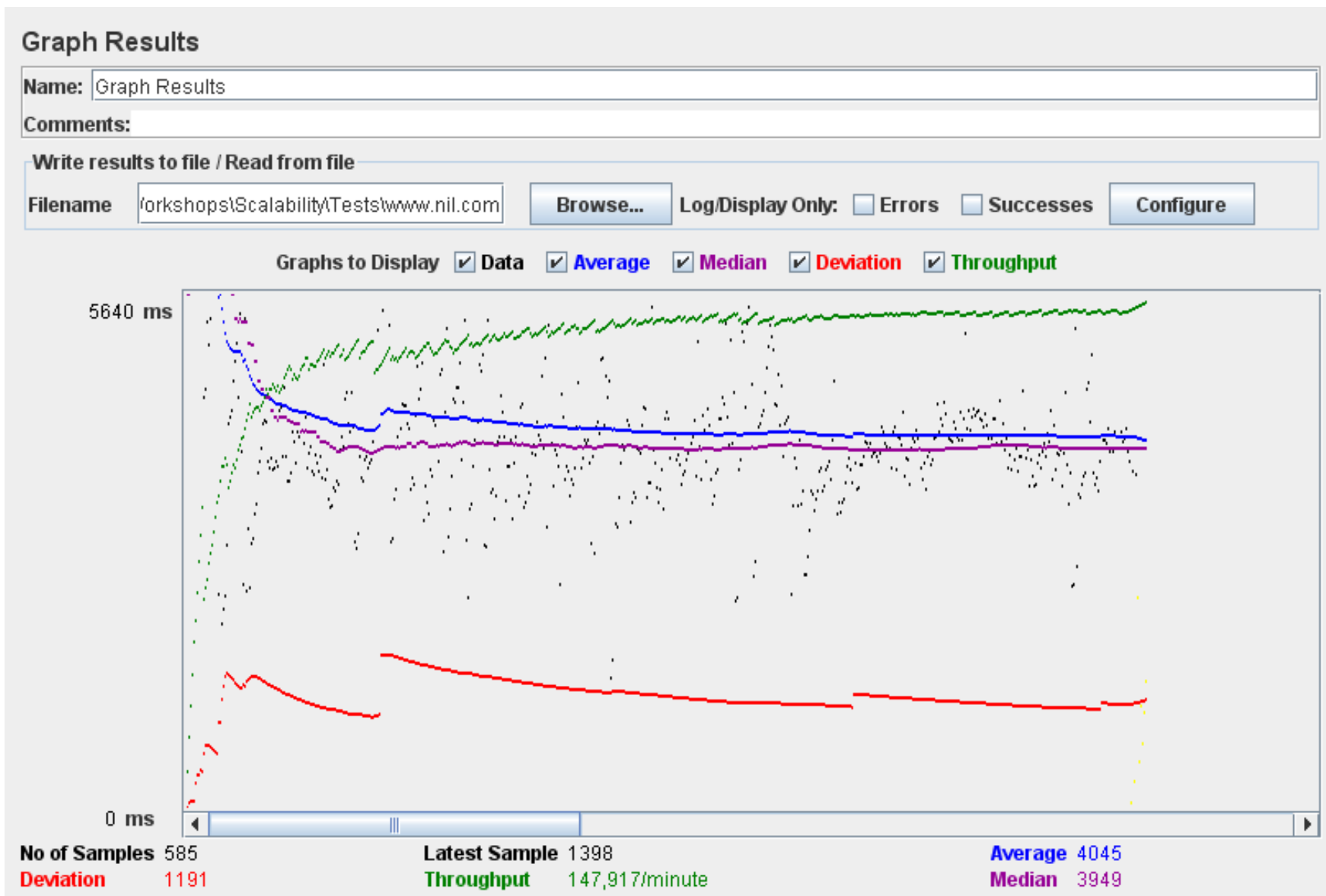


- Time to load the page: 857 msec (763 msec to DOMContentLoaded)
- Time spent in PHP script: 337 msec

# JMeter Single User Load



# Stress Test: 10 Users



# Details: Home Page From Busy Server

Name	Method	Status	Type	Initiator	Size	Time	Timeline	1.00s	1.50s	2.00s	2.50s	3.00s	3.50s
Main_Page	GET	200	text/html	Other	15.80KB	3.12s							
SelectCategoryTagCloud.css	GET	200	text/css	Main_Page:8	2.41KB	12ms							
wiki20.css	GET	200	text/css	Main_Page:12	12.83KB	79ms							
ajax.js	GET	200	text/java...	Main_Page:47	4.96KB	19ms							
jquery.min.js	GET	200	text/java...	Main_Page:47	24.41KB	94ms							
jquery-ui.min.js	GET	200	text/java...	Main_Page:47	49.79KB	211ms							
wiki20.js	GET	200	text/java...	Main_Page:47	2.24KB	91ms							
bodybg.jpg	GET	200	image/jpeg	Main_Page:66	1.36KB	53ms							
headerbg.jpg	GET	200	image/jpeg	Main_Page:69	9.81KB	67ms							
ipSpaceLogo.jpg	GET	200	image/jpeg	Main_Page:72	5.49KB	54ms							
WkIvan.png	GET	200	image/png	Main_Page:108	1.73KB	52ms							
WkURHere.png	GET	200	image/png	Main_Page:109	7.28KB	52ms							
IOS_Hints_home-photo.jpg	GET	200	image/jpeg	Main_Page:114	83.12KB	115ms							
wikiBullet.gif	GET	200	image/gif	Main_Page:127	1.09KB	74ms							
Pipi_150x150.jpg	GET	200	image/jpeg	Main_Page:201	8.03KB	88ms							
ga.js	GET	200	text/java...	Main_Page:264	13.46KB	191ms							
_utm.gif	GET	200	image/gif	ga.js:51	376B	75ms							

17 requests | 244.19KB transferred | 3.50s (onload: 3.50s, DOMContentLoaded: 3.22s)

- Total time: 3.50 seconds
- Time spent waiting for PHP script: 2.87 seconds

Maybe it's not a network problem

# What's Going On?

```
top - 14:32:14 up 8 days, 15:08, 1 user, load average: 7.29, 2.82, 1.72
Tasks: 125 total, 12 running, 113 sleeping, 0 stopped, 0 zombie
Cpu(s): 97.0%us, 2.3%sy, 0.0%ni, 0.0%id, 0.0%wa, 0.0%hi, 0.7%si, 0.0%st
Mem: 2055660k total, 1985220k used, 70440k free, 163088k buffers
Swap: 4128760k total, 29576k used, 4099184k free, 518016k cached
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
18010	apache	20	0	332m	42m	6156	R	9.0	2.1	0:04.97	httpd
18254	apache	20	0	332m	42m	6156	R	9.0	2.1	0:04.04	httpd
16052	apache	20	0	332m	42m	6240	R	8.6	2.1	0:09.08	httpd
18391	apache	20	0	332m	42m	6156	R	8.0	2.1	0:02.44	httpd
18392	apache	20	0	333m	42m	6232	R	8.0	2.1	0:01.77	httpd
18166	apache	20	0	332m	42m	6152	R	7.7	2.1	0:04.97	httpd
14677	apache	20	0	334m	43m	6888	R	7.3	2.2	0:13.07	httpd
18370	apache	20	0	332m	42m	6152	S	7.0	2.1	0:04.63	httpd
12470	apache	20	0	337m	45m	6924	R	6.3	2.3	0:20.97	httpd
18007	apache	20	0	332m	42m	6152	S	6.3	2.1	0:04.85	httpd
18137	apache	20	0	332m	42m	6184	R	5.7	2.1	0:05.53	httpd
18314	apache	20	0	332m	42m	6176	R	5.7	2.1	0:01.65	httpd
18300	apache	20	0	332m	42m	6152	S	3.7	2.1	0:01.09	httpd
15626	apache	20	0	332m	42m	6168	S	3.3	2.1	0:09.71	httpd
16068	apache	20	0	332m	42m	6156	S	2.0	2.1	0:13.88	httpd
16050	apache	20	0	332m	42m	6164	R	1.0	2.1	0:09.15	httpd
1	root	20	0	19236	848	696	S	0.0	0.0	0:01.96	init



## Good News: Not Much Database Activity

```
MySQL on localhost (5.1.52)                               up 8+16:05:56 [15:29:56]
Queries: 47.0  qps:    0 Slow:    0.0          Se/In/Up/De(%):  00/00/00/00
              qps now:  0 Slow qps: 0.0  Threads:    8 (  1/  0) 00/00/00/00
Key Efficiency: 96.8%  Bps in/out:  0.0/  0.3  Now in/out:  8.2/ 1.5k
```

Id	User	Host/IP	DB	Time	Cmd	Query or State
--	----	-----	--	----	---	-----
88516	root	localhost		0	Query	show full processlist
90802		localhost		0	Sleep	
90804		localhost		0	Sleep	
90807		localhost		0	Sleep	
90808		localhost		0	Sleep	
90809		localhost		0	Sleep	
90812		localhost		0	Sleep	
90538		localhost		15	Sleep	
90470		localhost		18	Sleep	
88310		localhost		127	Sleep	
88256		localhost		183	Sleep	
88255		localhost		184	Sleep	

# What Next?

Hint: RTFM!

1. Enable PHP Opcode Caching / Accelerator  
APC (Alternative PHP Cache)

[http://www.mediawiki.org/wiki/Manual:Performance\\_tuning](http://www.mediawiki.org/wiki/Manual:Performance_tuning)

# Installing PHP Bytecode Compiler

## Graph Results

Name: Graph Results

Comments:

Write results to file / Read from file

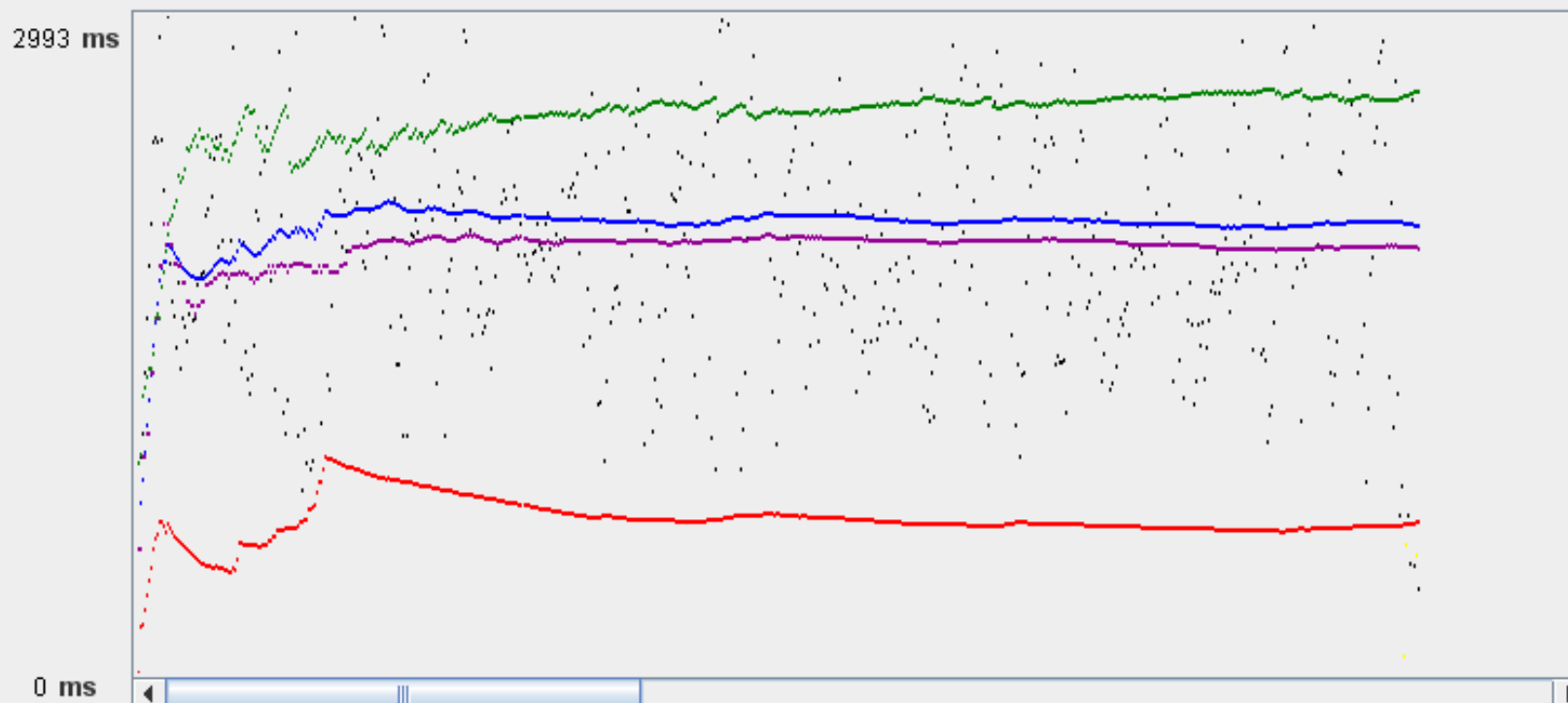
Filename: forkshospstScalability\Tests\www.nil.com

Browse...

Log/Display Only:  Errors  Successes

Configure

Graphs to Display  Data  Average  Median  Deviation  Throughput



No of Samples 610

Deviation 693

Latest Sample 389

Throughput 291,098/minute

Average 2041

Median 1939

4045 msec → 2041 msec

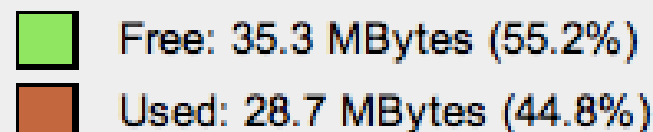
147 tpm → 291 tpm

# APC Opcode Cache Statistics (apc.php)

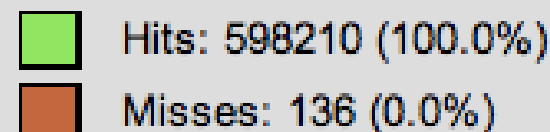
## Host Status Diagrams

### Memory Usage

(multiple slices indicate fragments)



### Hits & Misses



## Detailed Memory Usage and Fragmentation

Fragmentation: 0.13% ( 47.1 KBytes out of 35.3 MBytes in 51 fragments)

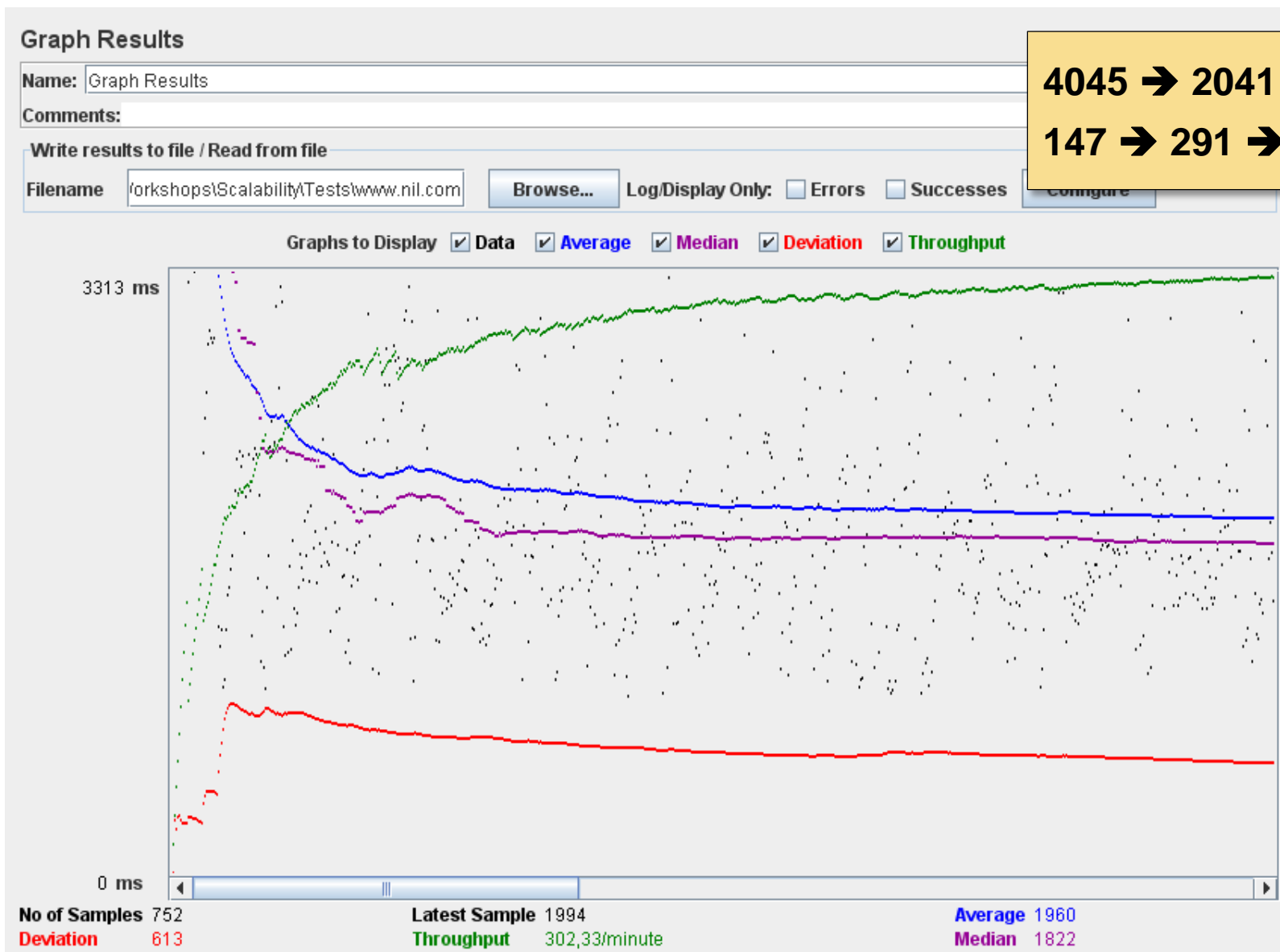
# More Optimization Steps

Hint: RTFM!

1. Enable PHP Opcode Caching / Accelerator  
APC (Alternative PHP Cache)
2. Enable MediaWiki Object Caching

[http://www.mediawiki.org/wiki/Manual:Performance\\_tuning](http://www.mediawiki.org/wiki/Manual:Performance_tuning)

# MediaWiki Object Caching



4045 → 2041 → 1960 msec  
 147 → 291 → 302 tpm

## APC User Object Caching (apc.php)

### User Cache Information

Cached Variables	1005 ( 1.2 MBytes)
Hits	25859
Misses	19012
Request Rate (hits, misses)	0.43 cache requests/second
Hit Rate	0.25 cache requests/second
Miss Rate	0.18 cache requests/second
Insert Rate	0.02 cache requests/second
Cache full count	0

# APC User Cache Contents

User Entry Label	Hits	Size
ioswiki:localisation:en	7802	193192
ioswiki:file:22709f03c3331b7fba55455e11603f9d	1284	1192
ioswiki:file:173657dc4c4aee9206ae81c1b659b3a2	1284	1192
ioswiki:file:015419b4dfd5cf3dc29f2f086515a8b5	1284	1192
ioswiki:messages:en	836	9384
ioswiki:preprocess-xml:75a216658d7ecc7a8a0e0ef8e25277e1:0	177	2216
ioswiki:preprocess-xml:c20dbd52c2a68f2940006a2d210153d0:0	149	2216
ioswiki:file:224d0b657b03a027bdfdf5285e191c5	125	1192
ioswiki:preprocess-xml:9781db202e640e3462a624987e9fd53d:0	108	2728
ioswiki:file:703c490761d7b675865f2e31a794e337	81	1704
ioswiki:file:187c63cf8f4daecb6aa73083095d20b4	81	1192
ioswiki:newtalk:ip:184.73.146.49	50	648
ioswiki:newtalk:ip:85.10.36.100	49	648
ioswiki:newtalk:ip:193.205.206.147	49	648



# CPU Still Fully Loaded

```
top - 16:35:48 up 8 days, 17:12, 2 users, load average: 5.81, 2.66, 1.19
Tasks: 127 total, 5 running, 122 sleeping, 0 stopped, 0 zombie
Cpu(s): 91.0%us, 4.0%sy, 0.0%ni, 3.7%id, 0.3%wa, 0.0%hi, 1.0%si, 0.0%st
Mem: 2055660k total, 1909604k used, 146056k free, 153224k buffers
Swap: 4128760k total, 28460k used, 4100300k free, 1121296k cached
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
16362	apache	20	0	383m	42m	23m	R	11.3	2.1	0:05.36	httpd
17856	apache	20	0	377m	37m	21m	S	10.6	1.9	0:04.84	httpd
18877	apache	20	0	377m	37m	21m	S	10.6	1.9	0:02.37	httpd
18879	apache	20	0	379m	38m	21m	R	8.0	1.9	0:02.44	httpd
16538	apache	20	0	377m	37m	21m	S	5.7	1.9	0:03.22	httpd
17547	apache	20	0	377m	37m	21m	S	5.7	1.9	0:05.06	httpd
17549	apache	20	0	377m	37m	21m	S	5.7	1.9	0:05.87	httpd
17593	apache	20	0	377m	37m	21m	S	5.7	1.9	0:07.10	httpd
14506	apache	20	0	377m	37m	22m	S	5.3	1.9	0:06.63	httpd
16749	apache	20	0	379m	39m	21m	R	5.3	1.9	0:04.81	httpd
17331	apache	20	0	377m	37m	21m	S	5.3	1.9	0:03.39	httpd
17546	apache	20	0	377m	37m	21m	S	5.3	1.9	0:04.93	httpd
17747	apache	20	0	377m	37m	21m	S	5.3	1.9	0:05.39	httpd
17734	apache	20	0	378m	38m	21m	R	3.7	1.9	0:03.38	httpd
1750	mysql	20	0	731m	34m	3844	S	0.7	1.7	10:13.05	mysqld
16825	apache	20	0	377m	37m	21m	S	0.7	1.9	0:04.85	httpd
1	root	20	0	19236	916	720	S	0.0	0.0	0:02.00	init

# More Optimization Steps

Hint: RTFM!

1. Enable PHP Opcode Caching / Accelerator  
APC (Alternative PHP Cache)
2. Enable MediaWiki Object Caching
3. Enable MediaWiki File Caching

[http://www.mediawiki.org/wiki/Manual:Performance\\_tuning](http://www.mediawiki.org/wiki/Manual:Performance_tuning)

# MediaWiki File Caching

## Graph Results

Name: Graph Results

Comments:

Write results to file / Read from file

Filename: forkshopst\Scalability\Tests\www.nil.com

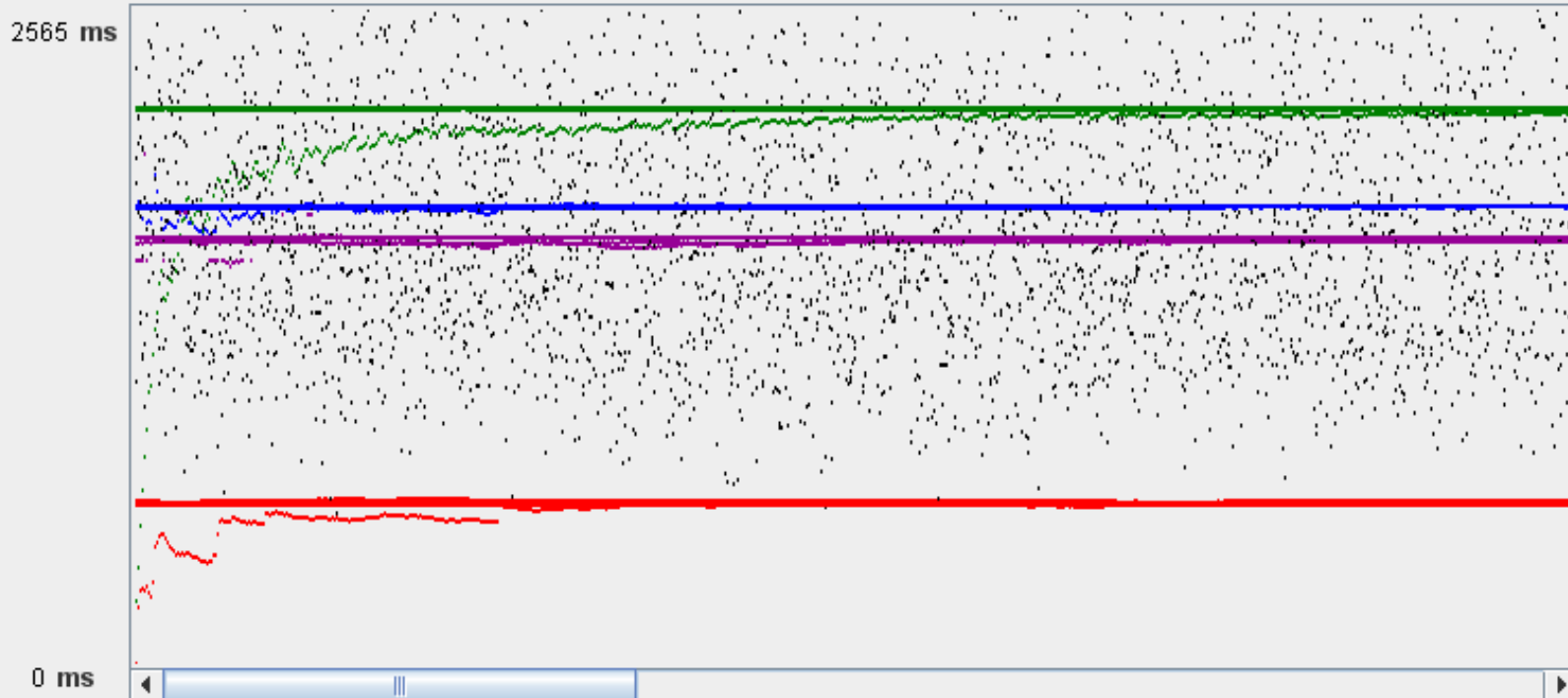
Browse...

Log/Display Only:  Errors  Successes

Configure

4045 → 2041 → 1960 → 1800 msec  
147 → 291 → 302 → 333 tpm

Graphs to Display  Data  Average  Median  Deviation  Throughput



No of Samples 8647  
Deviation 633

Latest Sample 2450  
Throughput 333,088/minute

Average 1796  
Median 1679

## Wait ... WHAT???

```
top - 16:26:46 up 8 days, 17:03, 1 user, load average: 0.13, 0.19, 0.32
Tasks: 136 total, 2 running, 134 sleeping, 0 stopped, 0 zombie
Cpu(s): 7.6%us, 1.7%sy, 0.0%ni, 86.4%id, 4.0%wa, 0.0%hi, 0.3%si, 0.0%st
Mem: 2055660k total, 1954296k used, 101364k free, 147956k buffers
Swap: 4128760k total, 28460k used, 4100300k free, 1187788k cached
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
14063	apache	20	0	375m	26m	13m	S	1.3	1.3	0:01.05	httpd
14144	apache	20	0	375m	26m	13m	S	1.0	1.3	0:01.13	httpd
7773	apache	20	0	379m	30m	13m	R	0.7	1.5	0:03.79	httpd
12969	apache	20	0	375m	26m	13m	S	0.7	1.3	0:01.43	httpd
14289	apache	20	0	375m	26m	13m	S	0.7	1.3	0:00.93	httpd
15388	apache	20	0	375m	26m	13m	S	0.7	1.3	0:00.31	httpd
15973	apache	20	0	375m	26m	13m	S	0.7	1.3	0:00.10	httpd
16043	apache	20	0	375m	26m	13m	S	0.7	1.3	0:00.11	httpd
10363	apache	20	0	375m	27m	13m	S	0.3	1.3	0:02.70	httpd
14467	apache	20	0	375m	26m	13m	S	0.3	1.3	0:00.64	httpd
15128	apache	20	0	375m	26m	13m	S	0.3	1.3	0:00.45	httpd
15375	apache	20	0	375m	26m	13m	S	0.3	1.3	0:00.26	httpd
15461	apache	20	0	375m	26m	13m	S	0.3	1.3	0:00.31	httpd
15977	apache	20	0	370m	12m	3896	S	0.3	0.6	0:00.01	httpd
1	root	20	0	19236	916	720	S	0.0	0.0	0:02.00	init
2	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kthreadd

**Now it is a network problem – not enough bandwidth to the server**

# Changing The Tool: JMeter → ApacheBench

## Without file caching

```
$ ab -kt10 -c10 http://www.ipspace.net/Main_Page
```

```
[...]
```

```
Concurrency Level:      10
```

```
[...]
```

```
Requests per second:    5.68 [#/sec] (mean)
```

```
Time per request:       1760.429 [ms] (mean)
```

### Connection Times (ms)

	min	mean[+/-sd]	median	max
Connect:	0	3 6.4	0	25
Processing:	1548	1664 68.8	1651	1846
Waiting:	1458	1567 66.4	1554	1762
Total:	1548	1666 69.5	1653	1846

# File Caching Benchmark

```
$ ab -kt10 -c10 http://www.ipSpace.net/Main_Page
```

```
[...]
```

```
Concurrency Level:          10
```

```
[...]
```

```
Requests per second:       62.63 [#/sec] (mean)
```

```
Time per request:          159.658 [ms] (mean)
```

```
Connection Times (ms)
```

	min	mean	[+/-sd]	median	max
Connect:	0	0	1.1	0	10
Processing:	117	158	19.8	155	325
Waiting:	73	105	17.6	103	248
Total:	117	158	20.1	155	325

**4045 → 2041 → 1960 → 160 msec**  
**147 → 291 → 302 → 3700 tpm**

## Additional Steps

Hint: RTFM!

1. Enable PHP Opcode Caching / Accelerator  
APC (Alternative PHP Cache)
2. Enable MediaWiki Object Caching
3. Enable MediaWiki File Caching
4. **Fix MediaWiki caching behavior**
5. **Use mod\_disk\_cache with Apache**
6. Use HTTP reverse proxy / cache (Squid, Varnish)
7. Scale out (multiple servers behind a load balancer)
8. HipHop

[http://timj.testbit.eu/2011/02/09/using-mod\\_disk\\_cache-with-mediawiki/](http://timj.testbit.eu/2011/02/09/using-mod_disk_cache-with-mediawiki/)

## Mediawiki With Caching Fixes And mod\_disk\_cache

```
$ ab -kt10 -c10 http://www.ipospace.net/Main_Page
```

```
[...]
```

```
Concurrency Level:      10
```

```
[...]
```

```
Total transferred:    813423713 bytes
```

```
HTML transferred:     786091471 bytes
```

```
Requests per second:  5659.34 [# /sec] (mean)
```

```
Time per request:     1.767 [ms] (mean)
```

**4045 → 2041 → 1960 → 160 → 1.7 msec**

**147 → 291 → 302 → 3700 → 339000 tpm**

```
Connection Times (ms)
```

	min	mean	[+/-sd]	median	max
Connect:	0	0	0.3	0	25
Processing:	0	2	22.6	1	1716
Waiting:	0	1	21.2	1	1645
Total:	0	2	22.8	1	1719

**Requires minor changes to Mediawiki source code to fix caching behavior**



Questions?

