

SPEEDING UP THE WEB WITH PHP 7

PHPCONF TAIWAN 2015

TAIPEI

OCT.9, 2015

<http://talks.php.net/taiwan15>

Rasmus Lerdorf

[@rasmus](https://twitter.com/rasmus)



20 YEARS OF PHP!??



PHP ANNOUNCEMENT JUNE 8, 1995

POSTED TO COMP.INFOSYSTEMS.WWW.AUTHORING.CGI

Subject: Announce: Personal Home Page Tools (PHP Tools)

Announcing the Personal Home Page Tools (PHP Tools) version 1.0.
These tools are a set of small tight cgi binaries written in C.
They perform a number of functions including:

- Logging accesses to your pages in your own private log files
- Real-time viewing of log information
- Providing a nice interface to this log information
- Displaying last access information right on your pages
- Full daily and total access counters
- Banning access to users based on their domain
- Password protecting pages based on users' domains
- Tracking accesses ** based on users' e-mail addresses **
- Tracking referring URL's - HTTP_REFERER support
- Performing server-side includes without needing server support for it
- Ability to not log accesses from certain domains (ie. your own)
- Easily create and display forms
- Ability to use form information in following documents

Here is what you don't need to use these tools:

- You do not need root access - install in your ~/public_html dir



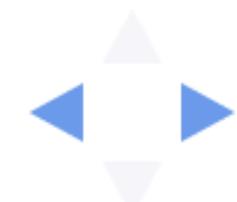
C API FOR THE WEB

```
void Cos(void) {
    Stack *s;
    char temp[64];

    s = Pop();
    if(!s) {
        Error("Stack error in cos");
        return;
    }
    sprintf(temp, "%f", cos(s->douval));
    Push(temp,DNUMBER);
}
```

AND YOU COULD THEN USE IT LIKE THIS:

```
<html><head><title>Cos Example</title></head>
<body><h1>Cos Example</h1>
<?echo Cos($input)>
</body></html>
```



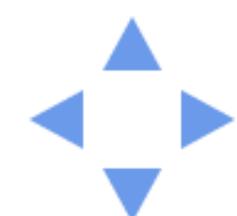
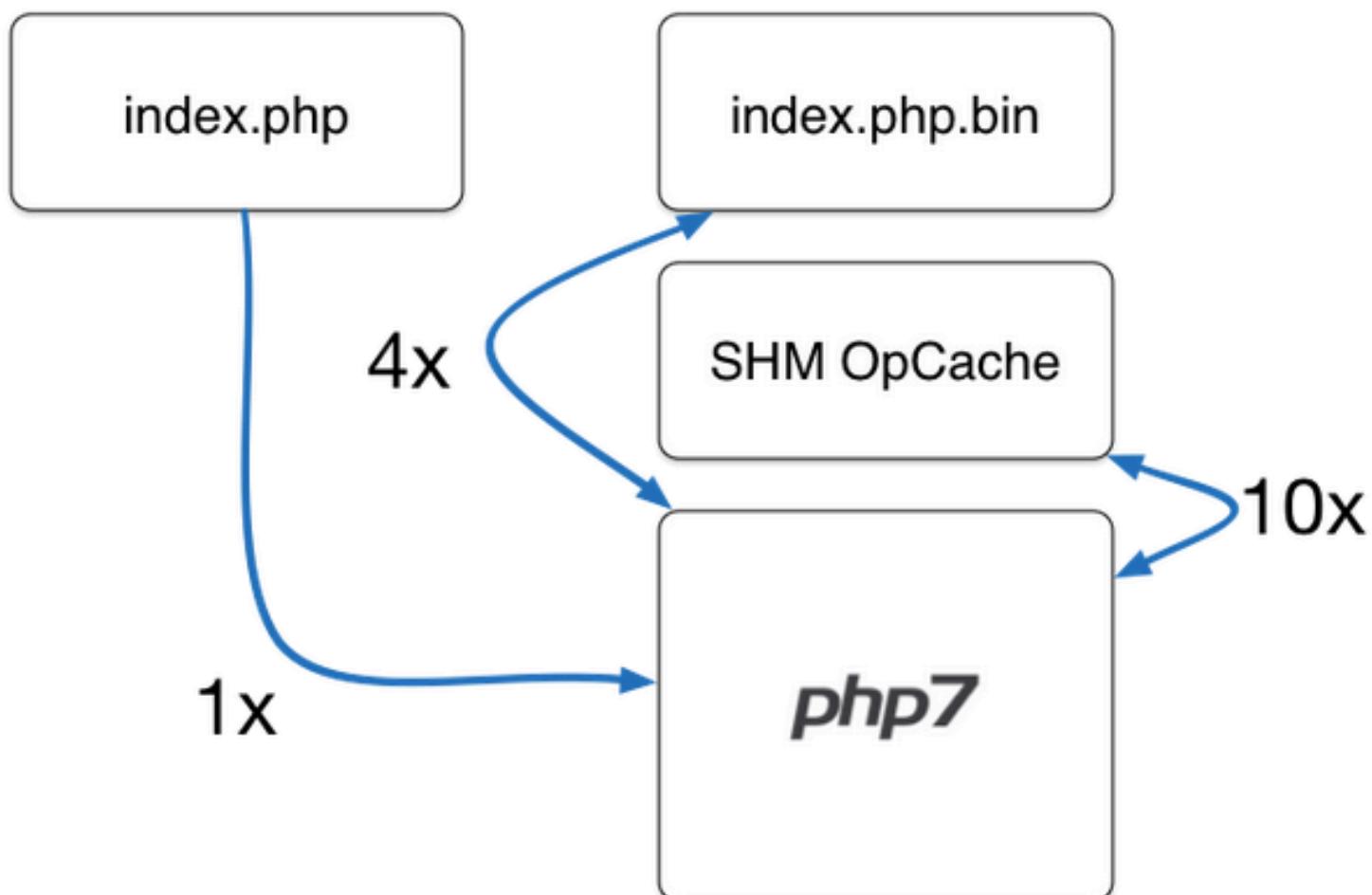
php7

✓ engine improvements

- 100%+ performance gain on most real-world applications
- Lower memory usage
- Native thread local storage

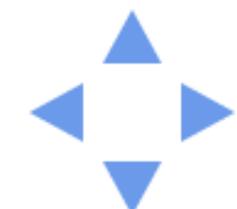


✓ Persistent secondary file-based cache for OPCache



```
; --enable-opcache-file  
; php.ini  
opcache.file_cache=/var/tmp  
  
; php-cli.ini  
opcache.enable_cli=1  
opcache.file_cache=/var/tmp  
opcache.file_cache_only=1
```

```
$ time composer >/dev/null  
real    0m0.040s  
user    0m0.032s  
sys     0m0.004s  
  
$ time composer >/dev/null  
real    0m0.019s  
user    0m0.016s  
sys     0m0.000s  
  
$ time php -d opcache.enable=0 /usr/local/bin/composer >/dev/null  
real    0m0.033s  
user    0m0.032s  
sys     0m0.000s
```



```
/var/tmp
└── 7eeb6fe88104116c27c5650ddd83abf0
    └── usr
        └── local
            └── bin
                └── composer.bin
└── 7eeb6fe88104116c27c5650ddd83abf0phar:
    └── usr
        └── local
            └── bin
                └── composer
                    ├── bin
                    │   └── composer.bin
                    └── src
                        ├── bootstrap.php.bin
                        └── Composer
                            └── Command
                                ├── AboutCommand.php.bin
                                ├── ArchiveCommand.php.bin
                                ├── ClearCacheCommand.php.bin
                                ├── Command.php.bin
                                ├── ConfigCommand.php.bin
                                ├── CreateProjectCommand.php.bin
                                ├── DependsCommand.php.bin
                                ├── DiagnoseCommand.php.bin
                                ├── DumpAutoloadCommand.php.bin
                                ├── GlobalCommand.php.bin
                                └── Helper
                                    └── DialogHelper.php.bin
                            └── HomeCommand.php.bin
                            └── TraitCommand.php.bin
```

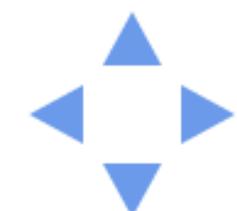


✓ Abstract Syntax Tree!!

```
echo substr("abc", [1,2]);
```

```
% phan -a test.php
AST_STMT_LIST @ 1
  0: AST_STMT_LIST @ 2
    0: AST_ECHO @ 2
      0: AST_CALL @ 2
        0: AST_NAME @ 2
          flags: NAME_NOT_FQ (1)
          0: "substr"
        1: AST_ARG_LIST @ 2
          0: "abc"
          1: AST_ARRAY @ 2
            0: AST_ARRAY_ELEM @ 2
              flags: 0
              0: 1
              1: null
            1: AST_ARRAY_ELEM @ 2
              flags: 0
              0: 2
              1: null
```

```
% phan -a test.php
test.php:2 TypeError arg#2(start) is int[] but substr() takes int
```



✓ Return Types

```
function get_config(): array {
    return 42;
}
get_config();

// Catchable fatal error: Return value of get_config() must
// be of the type array, integer returned in %s on line %d
```



✓ Coercive Scalar Types

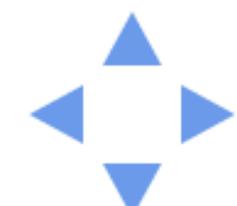
```
function logmsg(string $msg, int $level, float $severity) {
    var_dump($msg);      // string(1) "1"
    var_dump($level);    // int(2)
    var_dump($severity); // float(3)
}
logmsg(1, "2.5", 3);
```

✓ Strict Scalar Types

```
declare(strict_types=1);

logmsg(1, "2.5", 3);
```

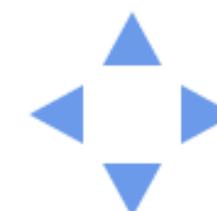
```
Fatal error: Argument 1 passed to logmsg() must be of the
type string, integer given
```



✓ Anonymous Classes

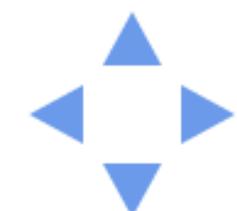
```
return new class($controller) implements Page {
    public function __construct($controller) {
        /* ... */
    }
    /* ... */
};

class MyObject extends MyStuff {
    public function getInterface() {
        return new class implements MyInterface {
            /* ... */
        };
    }
}
```



✓ Null Coalesce Operator

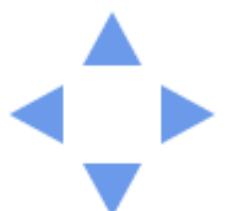
```
$a = NULL;  
$b = 1;  
$c = 2;  
  
echo $a ?? $b; // 1  
echo $c ?? $b; // 2  
echo $a ?? $b ?? $c; // 1  
echo $a ?? $x ?? $c; // 2
```



✓ Spaceship Operator

```
| =| Tie Fighter  
k=k Tie Interceptor  
<==> Tie Bomber  
<=> Tie Advanced X1 ✓
```

```
function cmp_php5($a, $b) {  
    return ($a < $b) ? -1 : (($a > $b) ? 1 : 0);  
}  
  
function cmp_php7($a, $b) {  
    return $a <=> $b;  
}
```

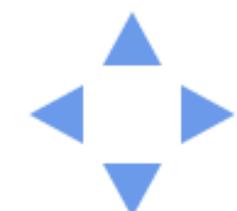


✓ Exceptions on Fata

```
function call_method($obj) {
    $obj->method();
}

call_method(null);
// Fatal error: Call to a member function method() on a non-object
```

```
try {
    call_method(null);
} catch (EngineException $e) {
    echo "Exception: {$e->getMessage()}\n";
}
// Exception: Call to a member function method() on a non-object
```

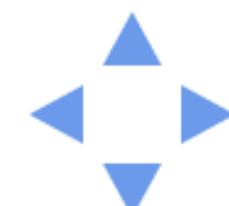


✓ Zero-cost Assertions

```
function test($arg) {
    assert($arg > 20 && $arg < 110, "$arg is invalid");
}
ini_set('zend.assertions',0); test(16);
ini_set('zend.assertions',1); test(17);
ini_set('assert.exception',1); test(18);
```

```
Warning: assert(): 17 is invalid failed in /home/rasmus/assert.php on line 3
Fatal error: Uncaught AssertionException: 18 is invalid in /home/rasmus/assert.php:3
Stack trace:
#0 /home/rasmus/assert.php(3): assert(false, '18 is invalid')
#1 /home/rasmus/assert.php(13): test(18)
#2 {main}
thrown in /home/rasmus/assert.php on line 3
```

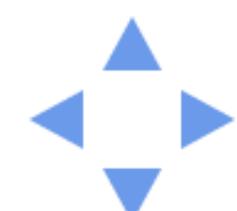
```
; Completely skip compiling assert() calls
; (can only be set in php.ini)
zend.assertions = -1
```



✓ Added Closure::call()

```
$f = function () {
    return $this->n;
};
class MyClass {
    private $n = 42;
}
$myC = new MyClass;
$c = $f->bindTo($myC, "MyClass");
$c();
```

```
$f = function () {
    return $this->n;
};
class MyClass {
    private $n = 42;
}
$myC = new MyClass;
$f->call($myC);
```



✓ Removal of many deprecated features (Your PHP4 code will break!)

```
- ext/ereg (use ext/pcre instead)
- preg_replace() eval modifier (use preg_replace_callback() instead)
- ext/mysql (use ext/mysqli or ext/pdo_mysql instead)
- Assignment of new by reference
- Scoped calls of non-static methods from incompatible $this context

- dl() in php-fpm
- set_magic_quotes_runtime() and magic_quotes_runtime()
- set_socket_blocking() (use stream_set_blocking() instead)
- mcrypt_generic_end() (use mcrypt_generic_deinit() instead)
- mcrypt_ecb, mcrypt_cbc, mcrypt_cfb and mcrypt_ofb
  (use mcrypt_encrypt() and mcrypt_decrypt() instead)
- datefmt_set_timezone_id() and IntlDateFormatter::setTimeZoneID()
  (use datefmt_set_timezone() or IntlDateFormatter::setTimeZone() instead)

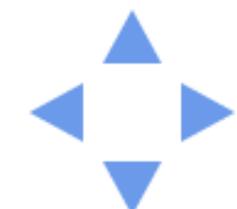
- xsl.security_prefs (use XsltProcessor::setSecurityPrefs() instead)
- iconv.input_encoding, iconv.output_encoding, iconv.internal_encoding,
  mbstring.http_input, mbstring.http_output and mbstring.internal_encoding
  (use php.input_encoding, php.internal_encoding and php.output_encoding)

- $is_dst parameter of the mktime() and gmmktime() functions
- # style comments in ini files (use ; style comments instead)
- String category names in setlocale() (use LC_* constants instead)
```



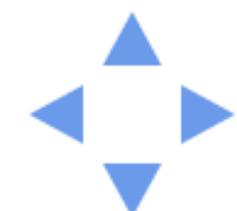
✓ New reserved words:

- bool
- int
- float
- string
- null
- false
- true
- resource
- object
- mixed
- numeric



- ✓ 64-bit integer support on Windows
- ✓ Cleanup edge-case integer overflow/underflow
- ✓ Support for strings with length $\geq 2^{31}$ bytes in 64 bit builds.
- ✓ Parse error on invalid numeric literals

```
$mask = 0855; // Parse error: Invalid numeric literal
```



✓ Uniform variable syntax

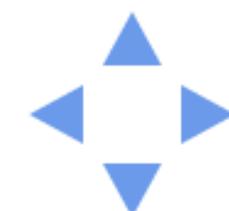
```
// left-to-right
$this->$belongs_to['column']
// vs.
$this->{$belongs_to['column']}

// support missing combinations of operations
$foo()['bar]()
[$obj1, $obj2][0]->prop
getStr(){0}

// support nested :::
$foo['bar']:::$baz
$foo::$bar:::$baz
$foo->bar():::baz()

// support nested ()
foo(){}
$foo->bar(){}
Foo:::bar(){}
$foo(){}

// support operations on arbitrary (...) expressions
(...)['foo']
(...)->foo
```



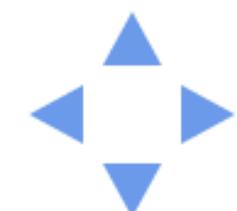
```
echo preg_replace('/:-:(.*?):-:/e', '$this->pres->\1', $text);
```

```
echo preg_replace_callback(
    '/:-:(.*?):-:/',
    function($matches) {
        return $this->pres->$matches[1]; // Oops!
    },
    $text);
```

```
% phan -b display.php
Files scanned: 1
Time:          0.13s
Classes:       8
Methods:       55
Functions:     5
Closures:      5
Traits:         0
Conditionals:  307
Issues found:  1

display.php:416 CompatError expression may not be PHP 7 compatible
```

```
echo preg_replace_callback(
    '/:-:(.*?):-:/',
    function($matches) {
        return $this->pres->{$matches[1]}; // Ok
    },
    $text);
```

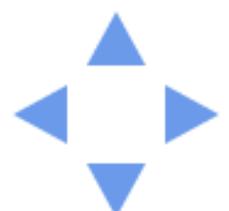


✓ Unicode Codepoint Escape Syntax

```
echo "\u{202E}Right-to-left text";  
echo "\u{1F602}";
```

😂txet tfel-ot-thgiR

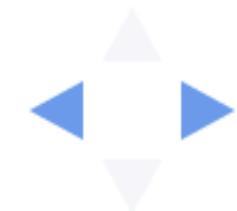
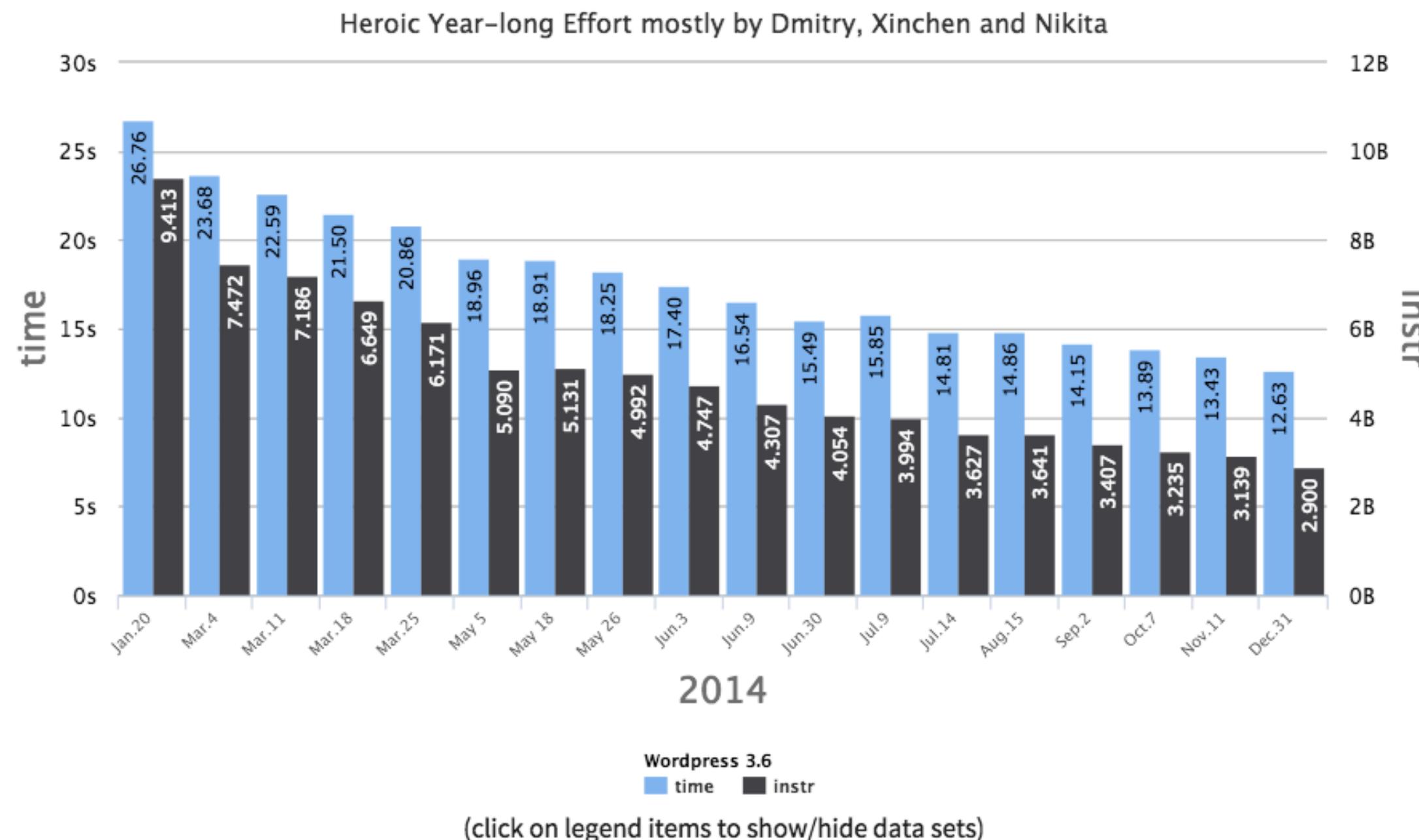
✓ ICU IntlChar class added to intl extension



GA release scheduled for October 2015



Time and number of machine instructions for 100 requests against Wordpress-3.6.0 front page

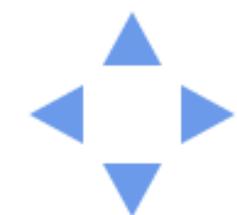


- zval size reduced from 24 to 16 bytes
- Hashtable size reduced from 72 to 56 bytes
- Hashtable bucket size reduced from 72 to 32 bytes
- Immutable array optimization

```
$a = [];
for($i=0; $i < 100000;$i++) $a[] = ['abc'];
echo memory_get_usage(true);
// PHP 5.x 43M
// PHP 7.0 6M
```



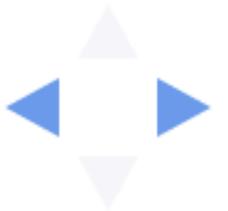
- Much more cpu cache friendly
- New memory allocator similar to jemalloc
- Faster hashtable iteration API
- Array duplication optimization
- PCRE JIT enabled by default
- Fast ZPP (ZendParseParameters) implementation
- Faster stack-allocated zvals (instead of heap)
- Optimized VM calling
- Global register variables with gcc 4.8+
- plus hundreds of micro-optimizations



JIT?



LIES, DAMN LIES AND BENCHMARKS



TEST BOX SPECS

- Gigabyte Z87X-UD3H i7-4771 4 cores @ 3.50GHz w/ 16G of Ram @ 1600MHz
- Hyperthreading enabled for a total of 8 virtual cores
- Toshiba THNSNHH256GBST SSD
- Linux debian 3.16.0-4-amd64 #1 SMP Debian 3.16.7-ckt9-2 (2015-04-13) x86_64 GNU/Linux
- MySQL 5.6.24
- nginx-1.6.2 + php-fpm for all tests unless indicated otherwise
- Quiet local 100Mbps network
- siege benchmark tool run from a separate machine



All versions of PHP compiled locally using gcc-4.9.2 -O2

configure flags

```
./configure --disable-debug          --with-apxs2=/usr/bin/apxs2 \
            --enable-zend-signals    --with-gd \
            --without-pear           --with-jpeg-dir=/usr \
            --with-png-dir=/usr     --with-vpx-dir=/usr \
            --with-t1lib=/usr        --with-freetype-dir=/usr \
            --enable-exif            --enable-gd-native-ttf \
            --with-zlib              --with-mysql=/usr \
            --with-gmp               --with-zlib-dir=/usr \
            --with-gettext            --with-kerberos \
            --with-imap-ssl          --with-mcrypt=/usr/local \
            --with-iconv              --enable-sockets \
            --with-openssl            --with-pspell \
            --with-pdo-sqlite         --with-pdo-mysql=mysqlnd \
            --enable-soap             --enable-xmlreader \
            --enable-phar=shared      --with-xsl \
            --enable-ftp              --enable-cgi \
            --with-curl=/usr          --with-tidy \
            --with-xmlrpc             --enable-mbstring \
            --enable-sysvsem          --enable-sysvshm \
            --enable-shmop             --with-readline \
            --enable-pcntl            --enable-fpm \
            --enable-intl             --enable-zip \
            --with-imap               --with-mysqli=mysqlnd \
            --enable-calendar          --prefix=/usr/local \
```



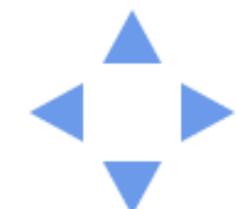
php.ini

```
[PHP]
zend.multibyte=On
date.timezone="America/Los_Angeles"
display_startup_errors=On
zend.enable_gc=Off
include_path="/usr/local/lib/php"
default_charset="UTF-8"
error_reporting=-1

variables_order=GPCS
sendmail_path=""

max_execution_time=60
memory_limit=512M
post_max_size=1024M
cgi.force_redirect=0
cgi.fix_pathinfo=1

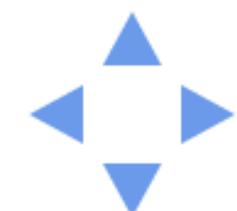
magic_quotes=0
magic_quotes_gpc=0
user_ini.filename=
realpath_cache_size=2M
cgi.check_shebang_line=0
```



php-fpm.d/www.conf

```
[www]
user = www-data
group = www-data
listen = /var/run/php-fpm.sock
listen.owner = www-data
listen.group = www-data
listen.mode = 0660

pm = static
pm.max_children = 10
pm.status_path = /status
ping.path = /ping
ping.response = pong
```



nginx.conf

```
user www-data;
worker_processes 4;
pid /var/run/nginx.pid;

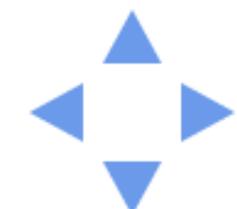
events {
    worker_connections 768;
}

http {
    sendfile on;
    tcp_nopush on;
    tcp_nodelay on;
    keepalive_timeout 65;
    types_hash_max_size 2048;

    include /etc/nginx/mime.types;
    default_type application/octet-stream;

    access_log /var/log/nginx/access.log;
    error_log /var/log/nginx/error.log;

    gzip on;
    gzip_disable "msie6";
}
```

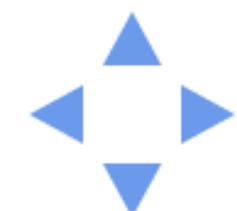


php.conf

```
location ~ \.php {  
    include fastcgi_params;  
    fastcgi_keep_conn on;  
    fastcgi_index index.php;  
    fastcgi_split_path_info ^(.+\.php)(/.+)$;  
    fastcgi_param PATH_INFO $fastcgi_path_info;  
    fastcgi_param SCRIPT_FILENAME $document_root$fastcgi_script_name;  
    fastcgi_intercept_errors on;  
    fastcgi_pass unix:/var/run/php-fpm.sock;  
}
```

hhvm.conf

```
location ~ \.php$ {  
    include fastcgi_params;  
    fastcgi_keep_conn on;  
    fastcgi_pass unix:/var/run/hhvm/server.sock;  
    fastcgi_index index.php;  
    fastcgi_param SCRIPT_FILENAME $document_root$fastcgi_script_name;  
}
```



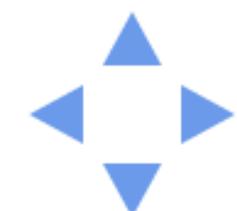
sites-enabled/wordpress

```
server {
    listen 80;
    server_name wordpress;
    root /var/www/wordpress;
    access_log /var/log/nginx/wordpress-access.log;
    error_log /var/log/nginx/wordpress-error.log;

    location / {
        index   index.html index.htm index.php;
        autoindex on;
    }

    location ~ /\. { return 403; }

    include backend.conf;
}
```



HipHop VM 3.7.0 (rel) from <http://dl.hhvm.com/ubuntu>

server.ini

```
pid = /var/run/hhvm/pid
hhvm.server.file_socket = /var/run/hhvm/server.sock
hhvm.server.type = fastcgi
hhvm.server.default_document = index.php
hhvm.log.use_log_file = true
hhvm.log.file = /var/log/hhvm/error.log
hhvm.repo.central.path = /var/run/hhvm/hhvm.hhbc
```

php.ini

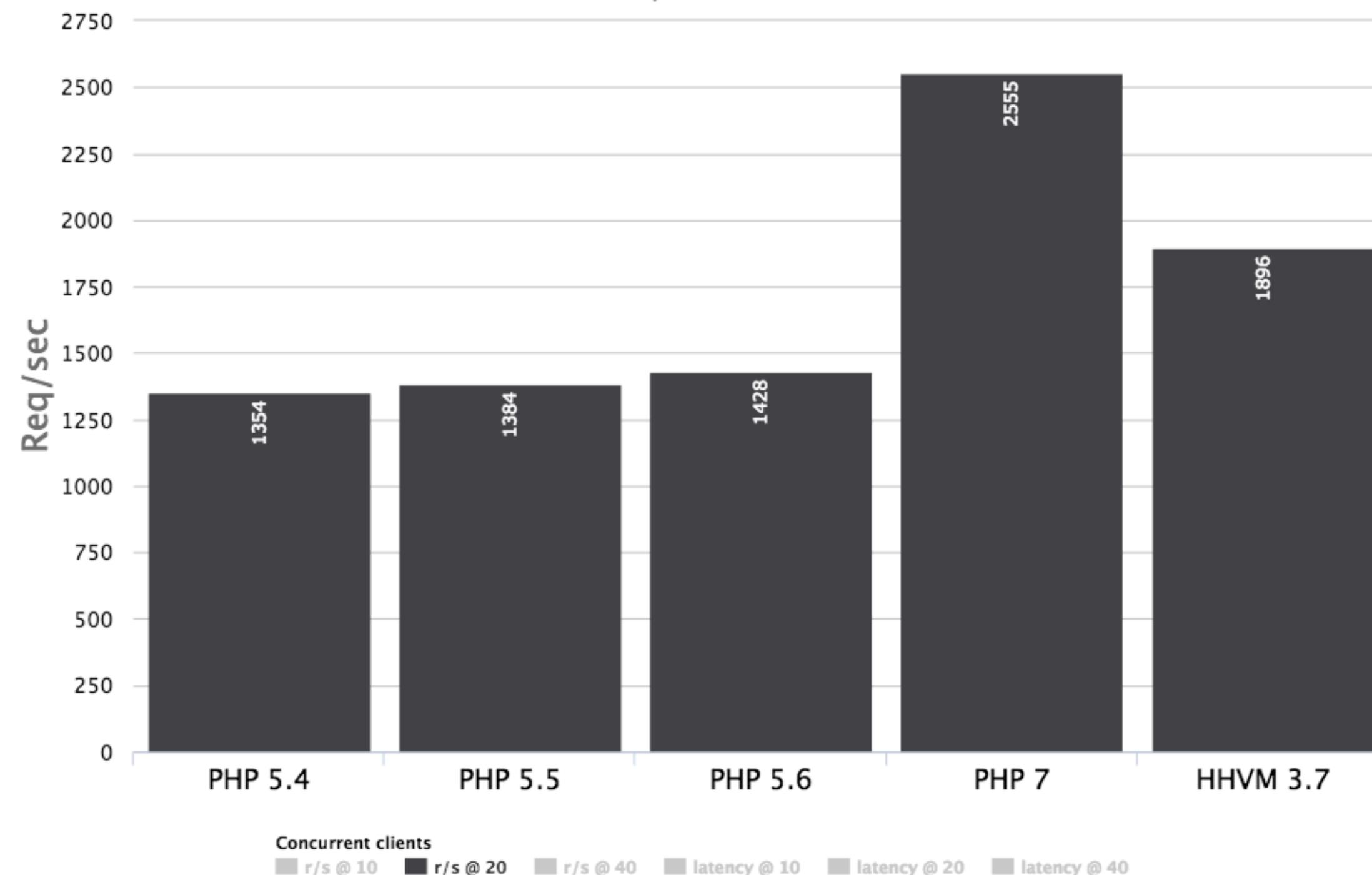
```
session.save_handler = files
session.save_path = /var/lib/php5
session.gc_maxlifetime = 1440

hhvm.log.level = Warning
hhvm.log.always_logUnhandledExceptions = true
hhvm.log.runtime_error_reporting_level = 8191
hhvm.mysql.typed_results = false
```



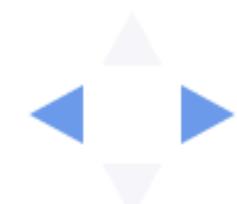
Drupal 8-git

node w/ 5 comments



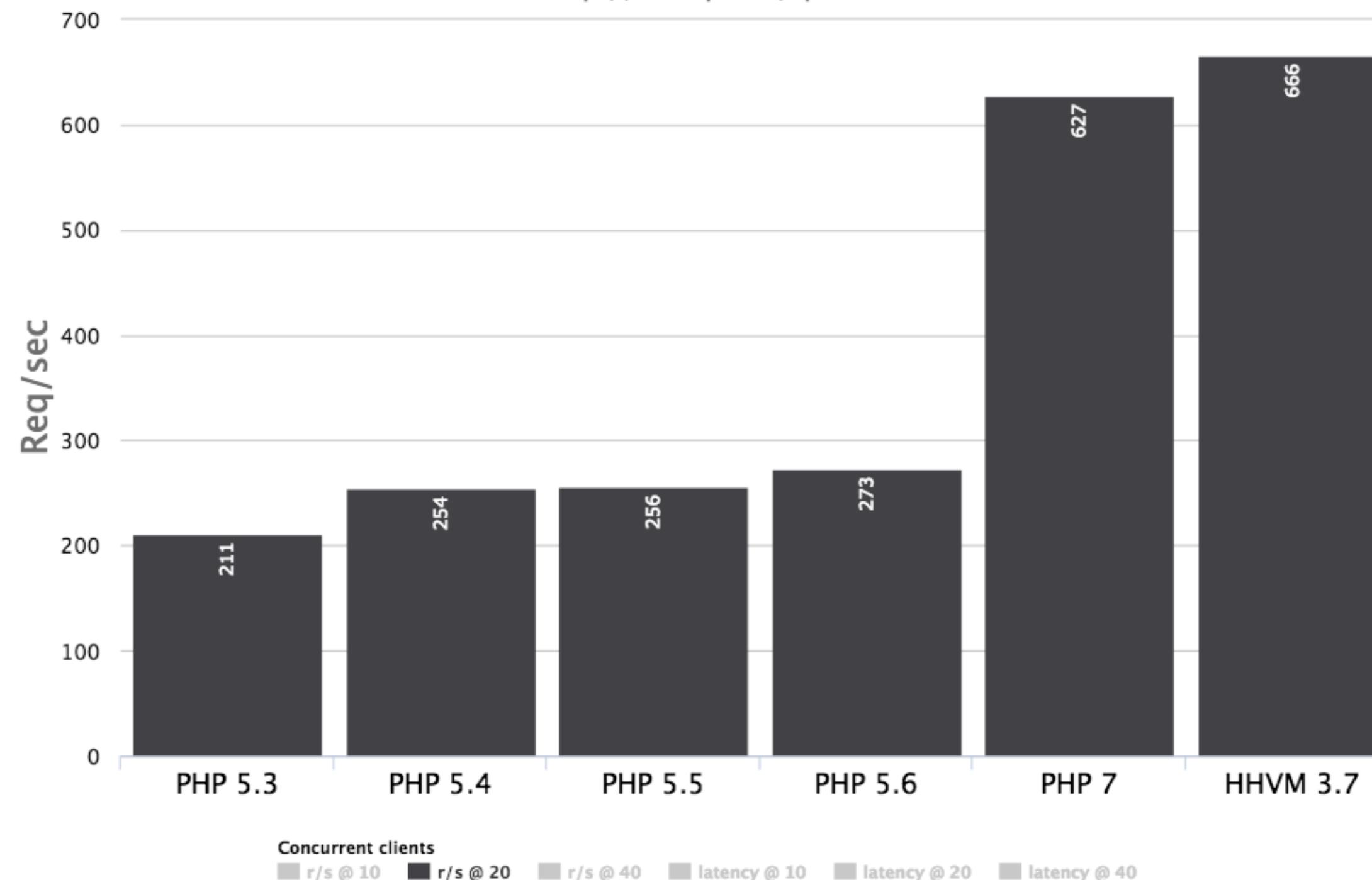
Concurrent clients

■ r/s @ 10 ■ r/s @ 20 ■ r/s @ 40 ■ latency @ 10 ■ latency @ 20 ■ latency @ 40



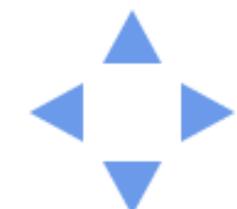
Wordpress-4.1.1

http://wordpress/?p=1



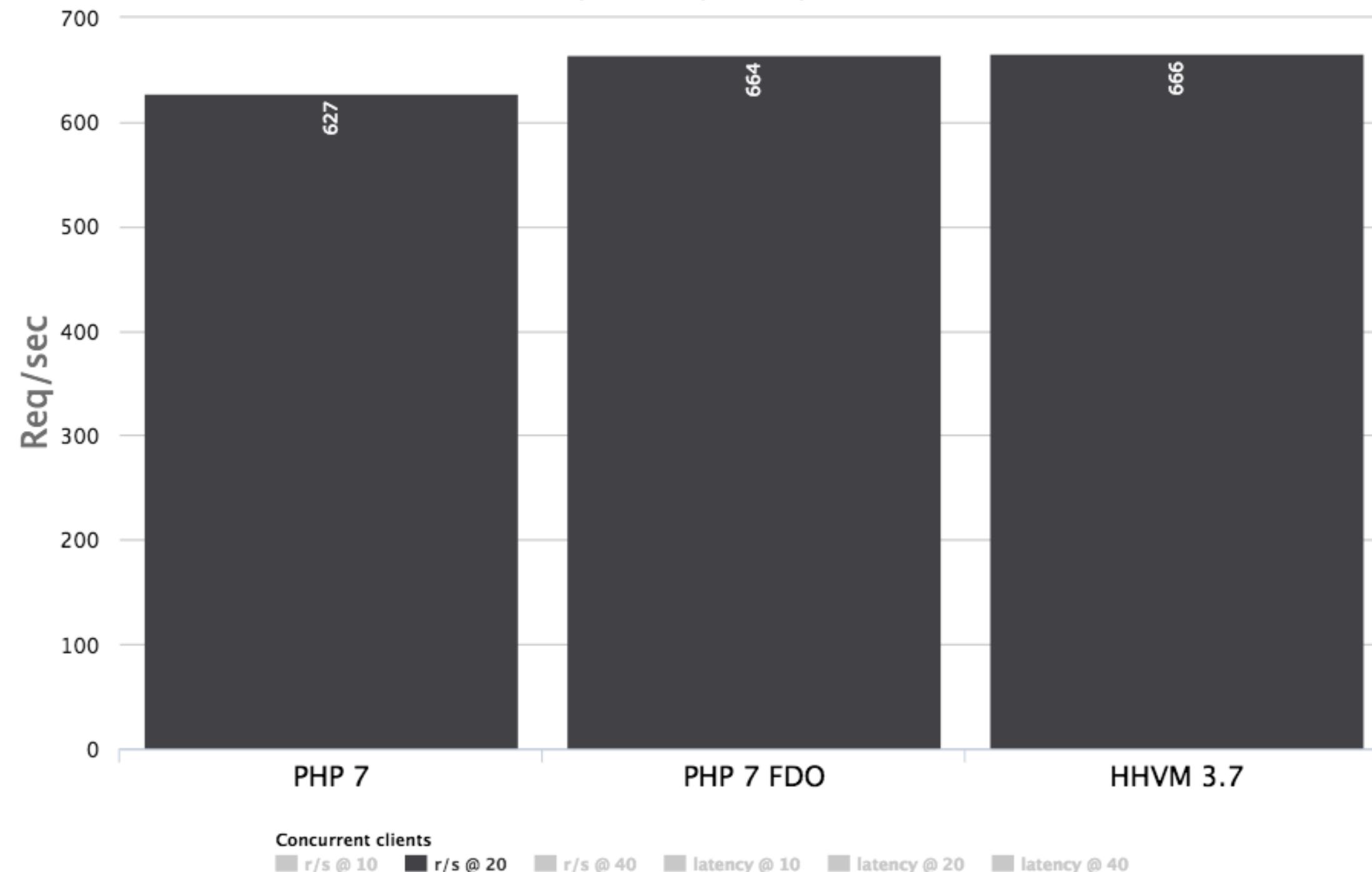
GCC Feedback-Directed Optimization (FDO)

```
$ make clean
$ make -j8 prof-gen
...
$ sapi/cgi/php-cgi -T 1000 /var/www/wordpress/index.php > /dev/null
$ make prof-clean
$ make -j8 prof-use
```



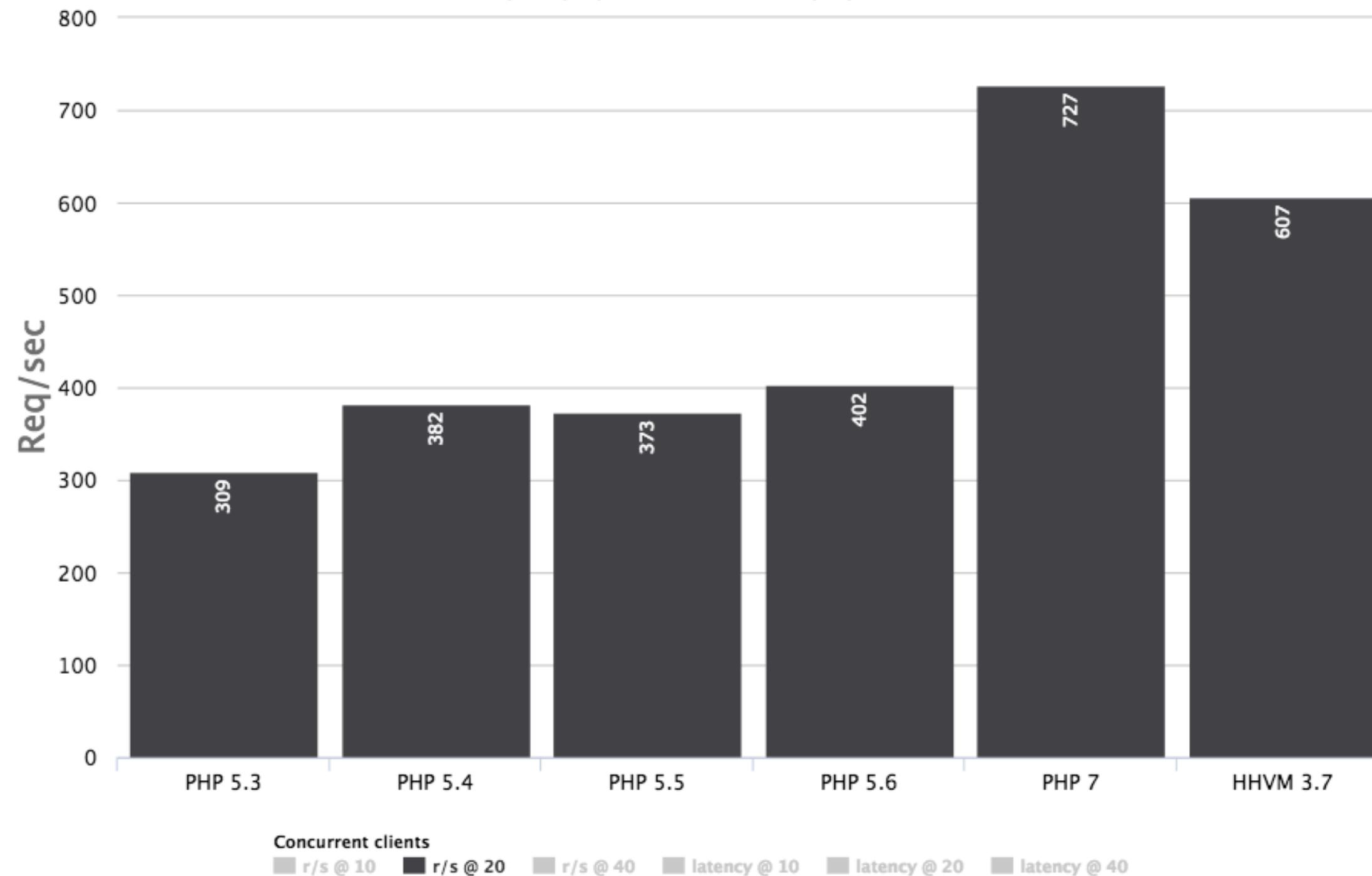
Wordpress-4.1.1

http://wordpress/?p=1



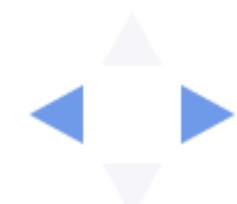
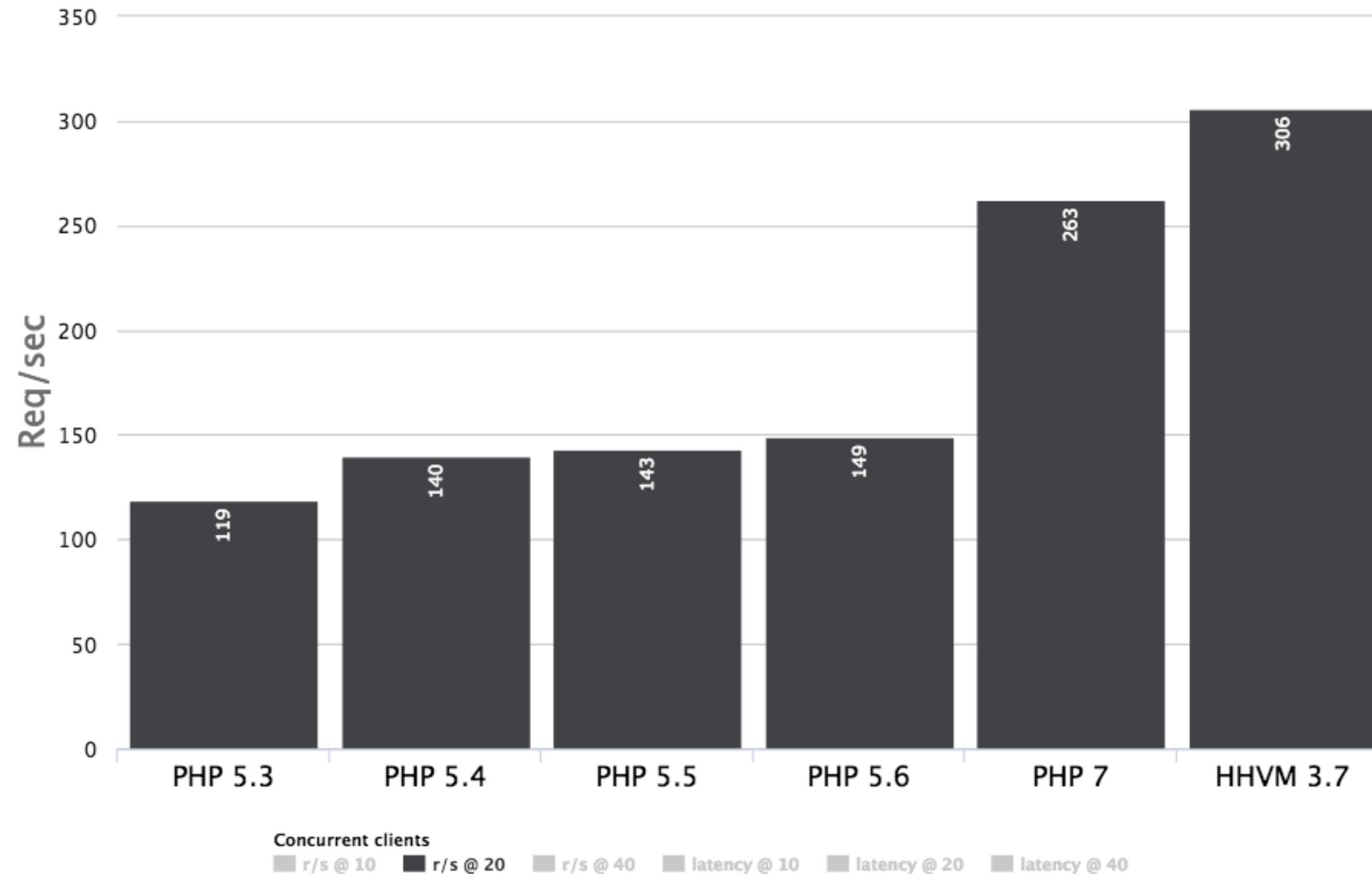
phpBB 3.1.3

<http://phpbb/viewforum.php?f=2>



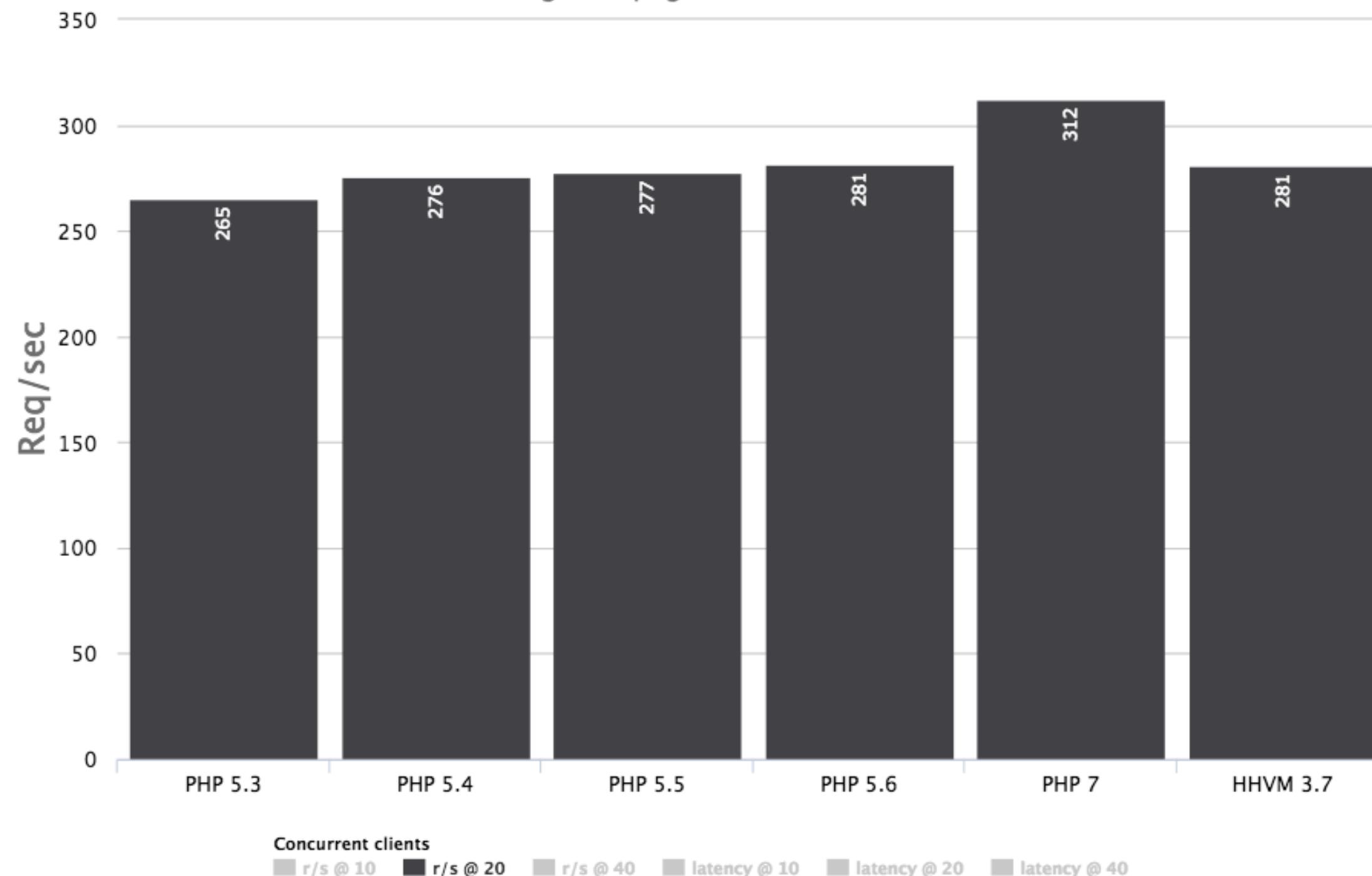
MediaWiki 1.24.1

default frontpage



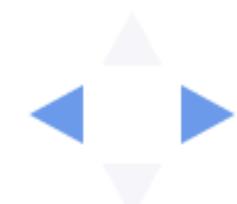
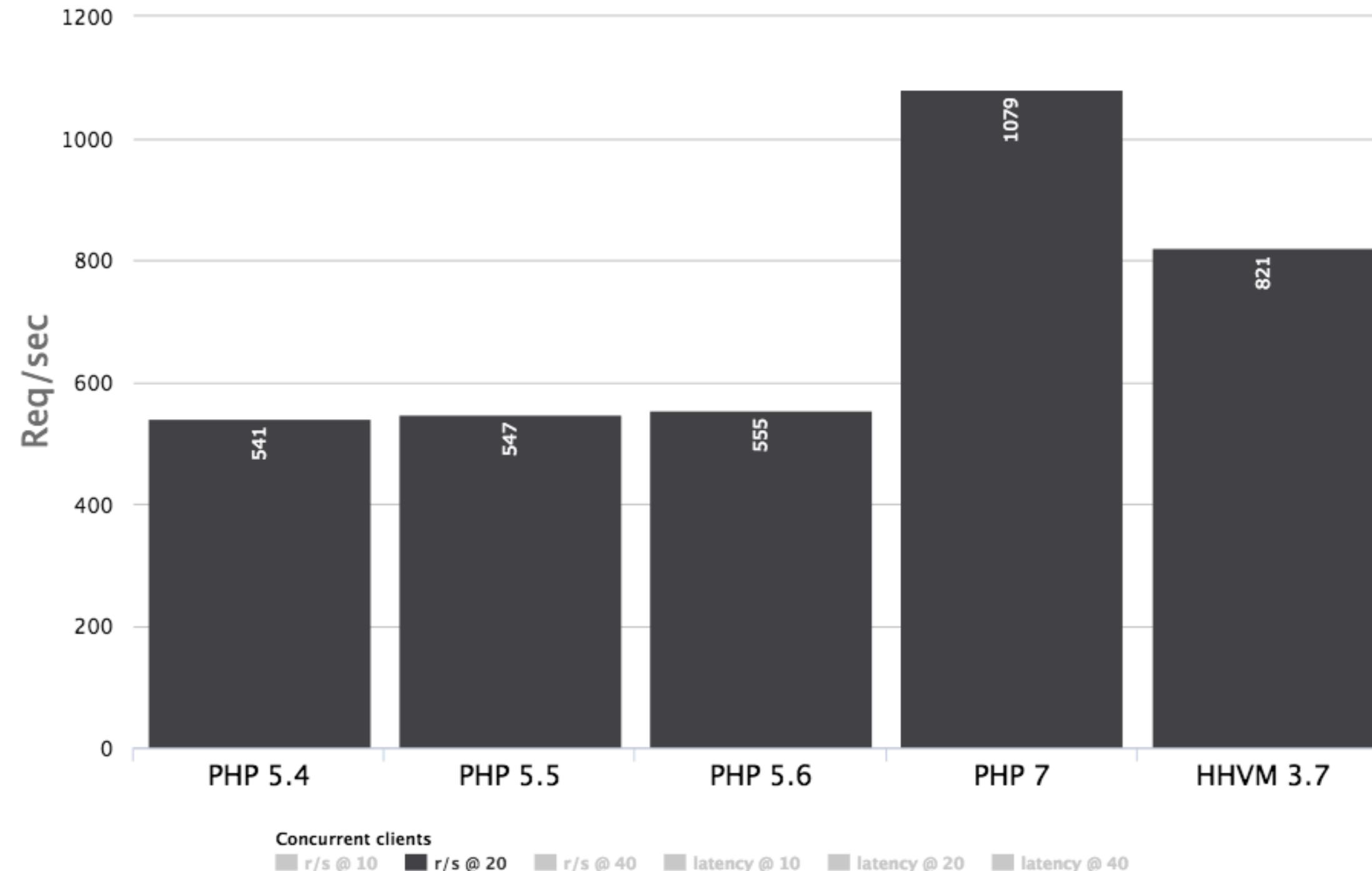
Opencart 2.0.2.0

Hitting frontpage of default install



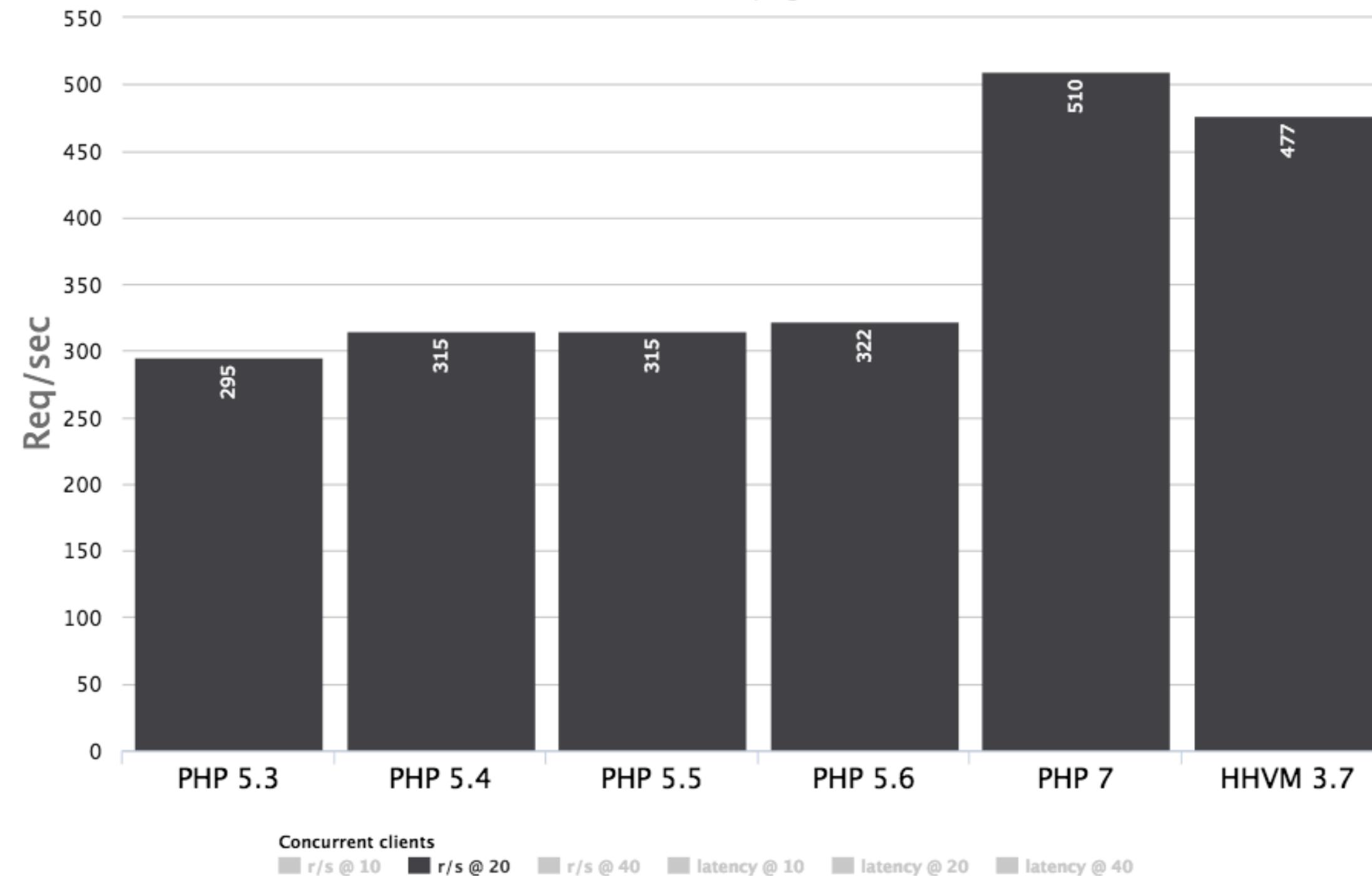
WardrobeCMS 1.2.0

front page with one short post



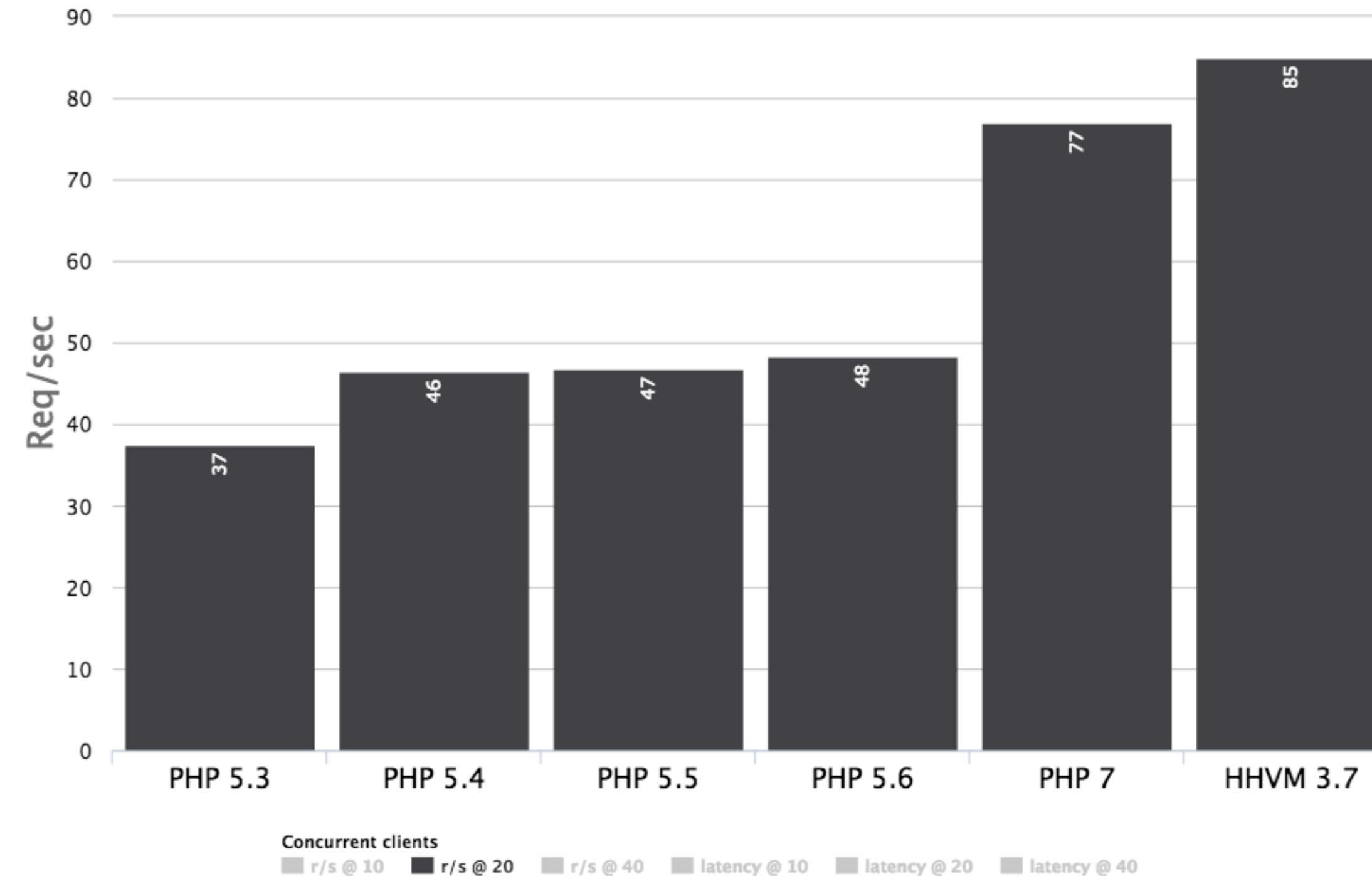
Geeklog 2.1.0

default frontpage

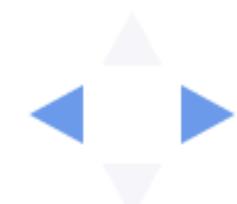


Magento-1.9.1.1

<http://magento/index.php/sale.html> (sample data)

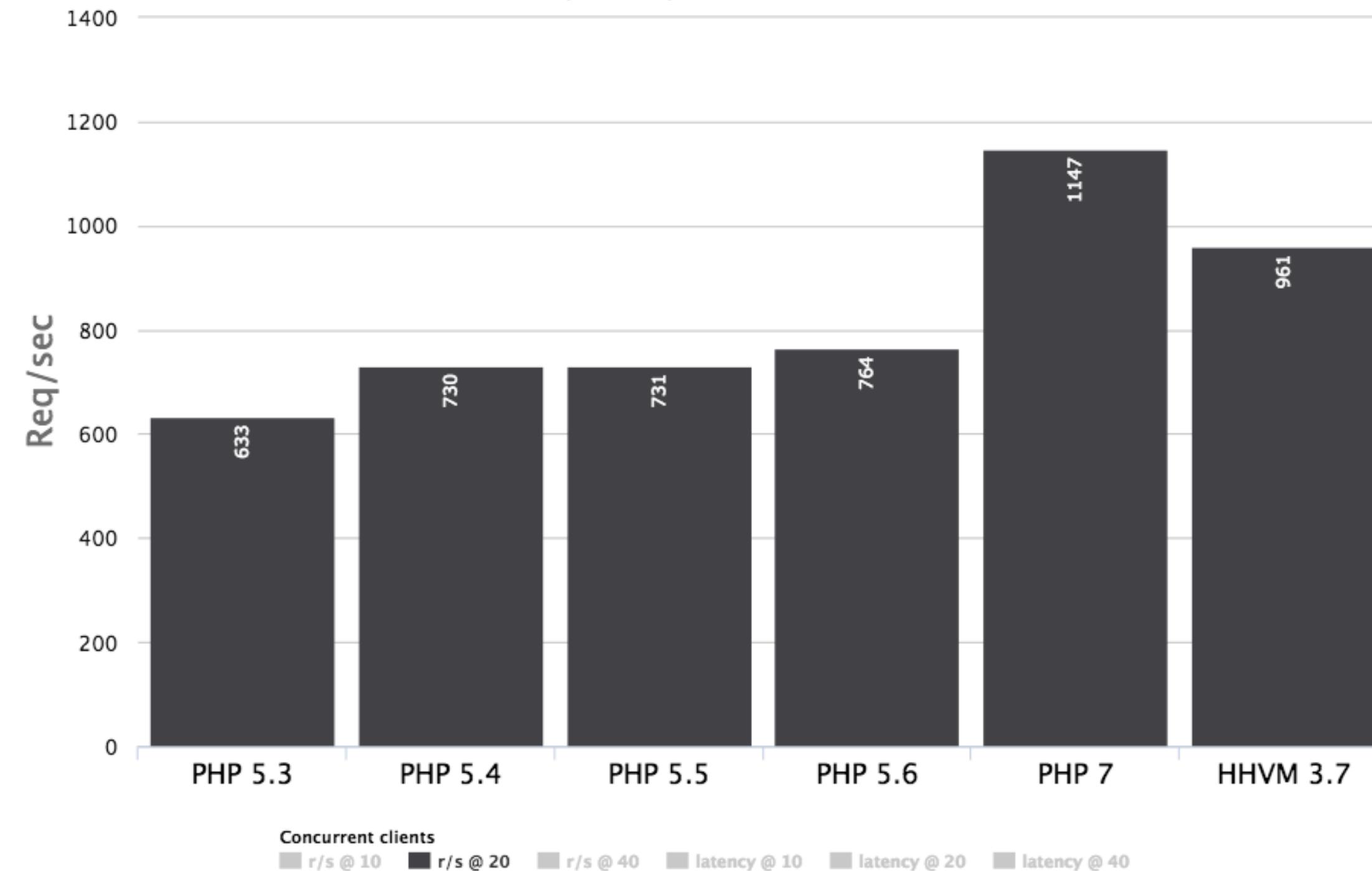


Concurrent clients
■ r/s @ 10 ■ r/s @ 20 ■ r/s @ 40 ■ latency @ 10 ■ latency @ 20 ■ latency @ 40



Traq 3.5.2

<http://traq/test/tickets/1>



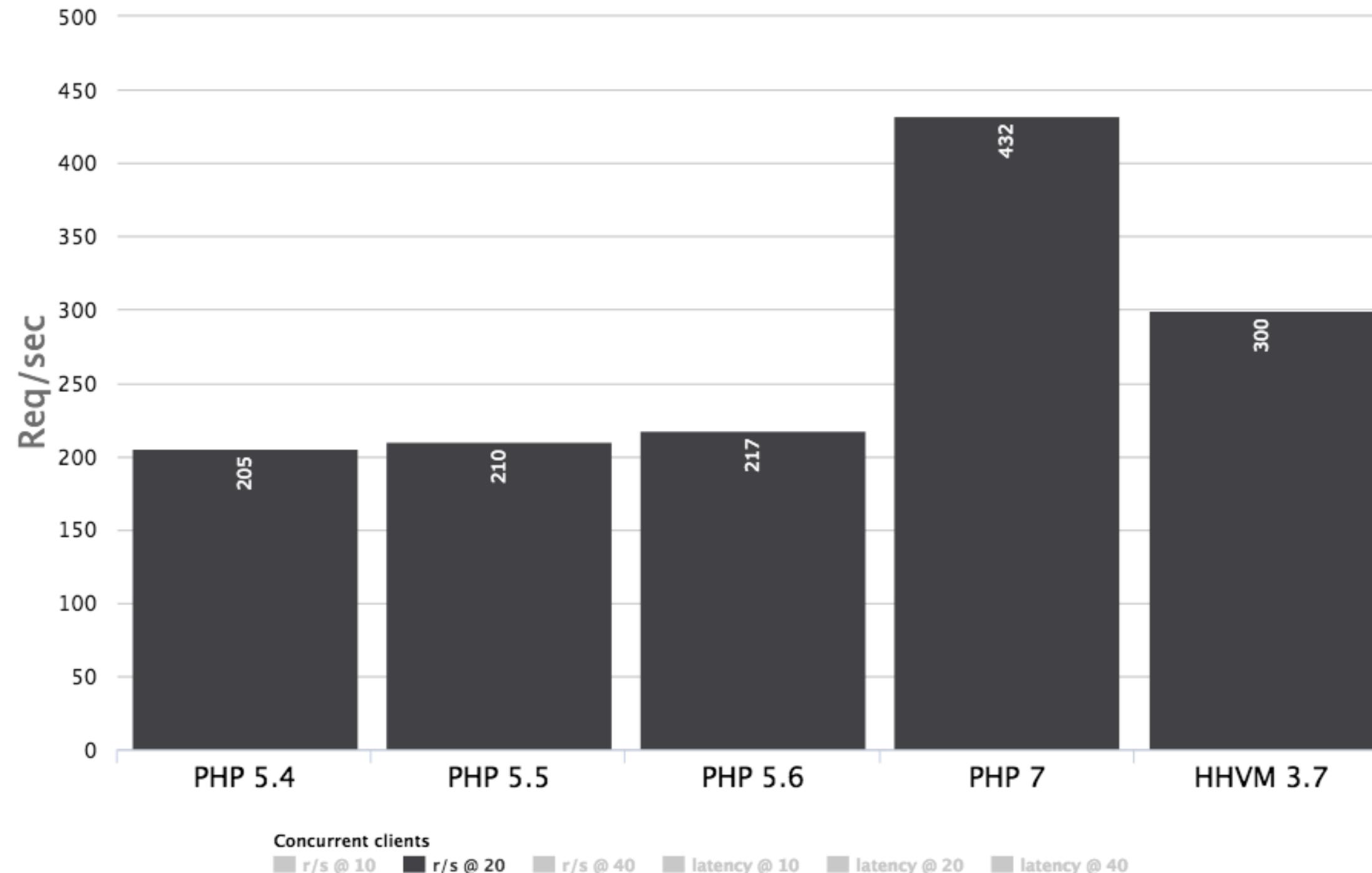
Had to fix one line of code in the Avalon database library:

```
diff --git a/database/model.php b/database/model.php
index 6c5f7da..c93e726 100644
--- a/database/model.php
+++ b/database/model.php
@@ -397,7 +397,7 @@ public function __get($var) {
        $belongs_to['column'] = $var . '_id';
    }
    $model = $belongs_to['model'];
-    return $this->$var = $model::find($belongs_to['foreign_key'], $thi
+    return $this->$var = $model::find($belongs_to['foreign_key'], $thi
} else {
    $val = $this->$var;
```



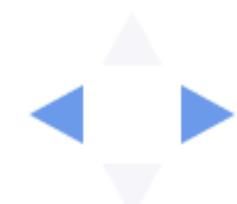
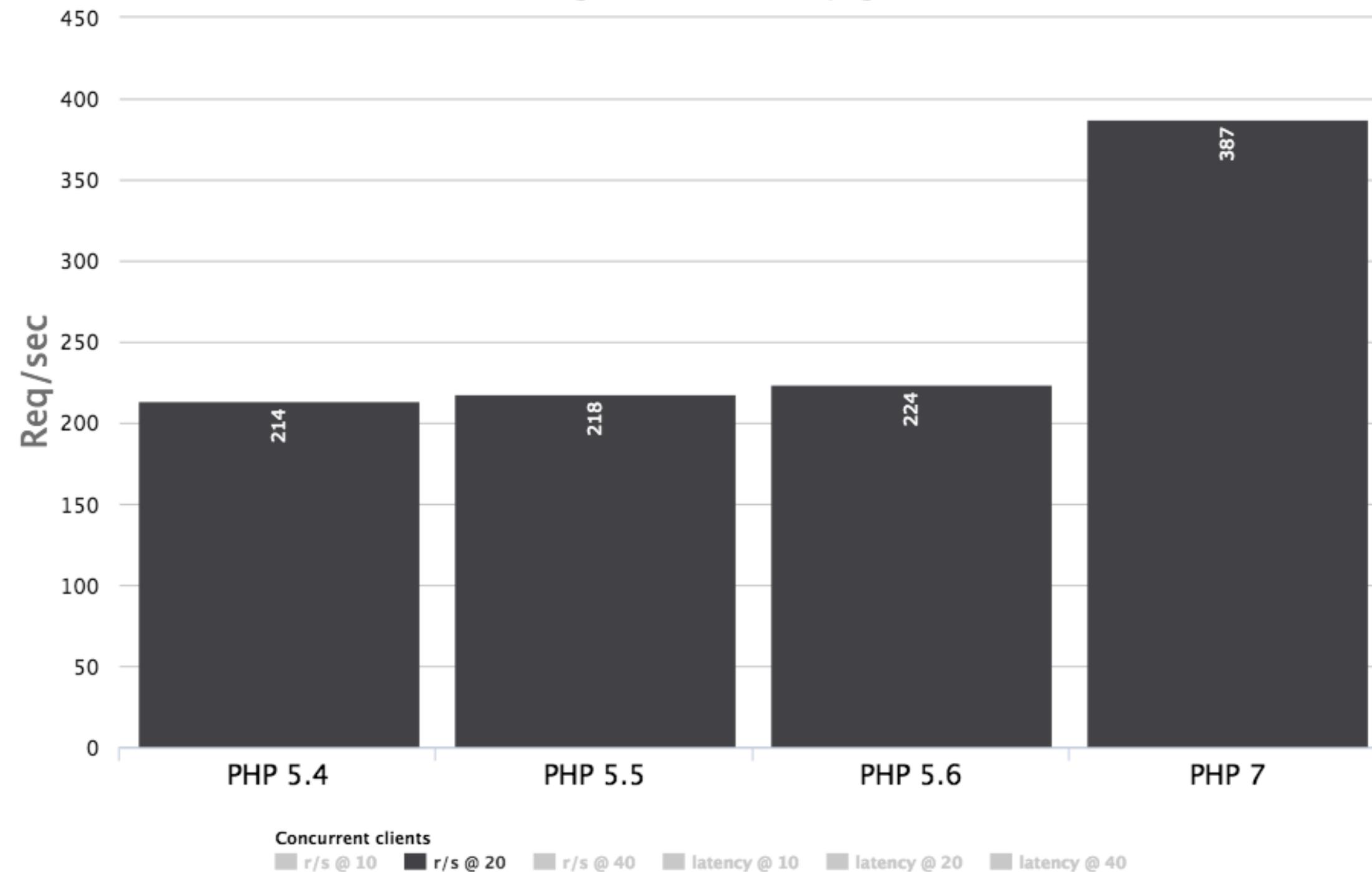
Cachet

frontpage with 1 incident



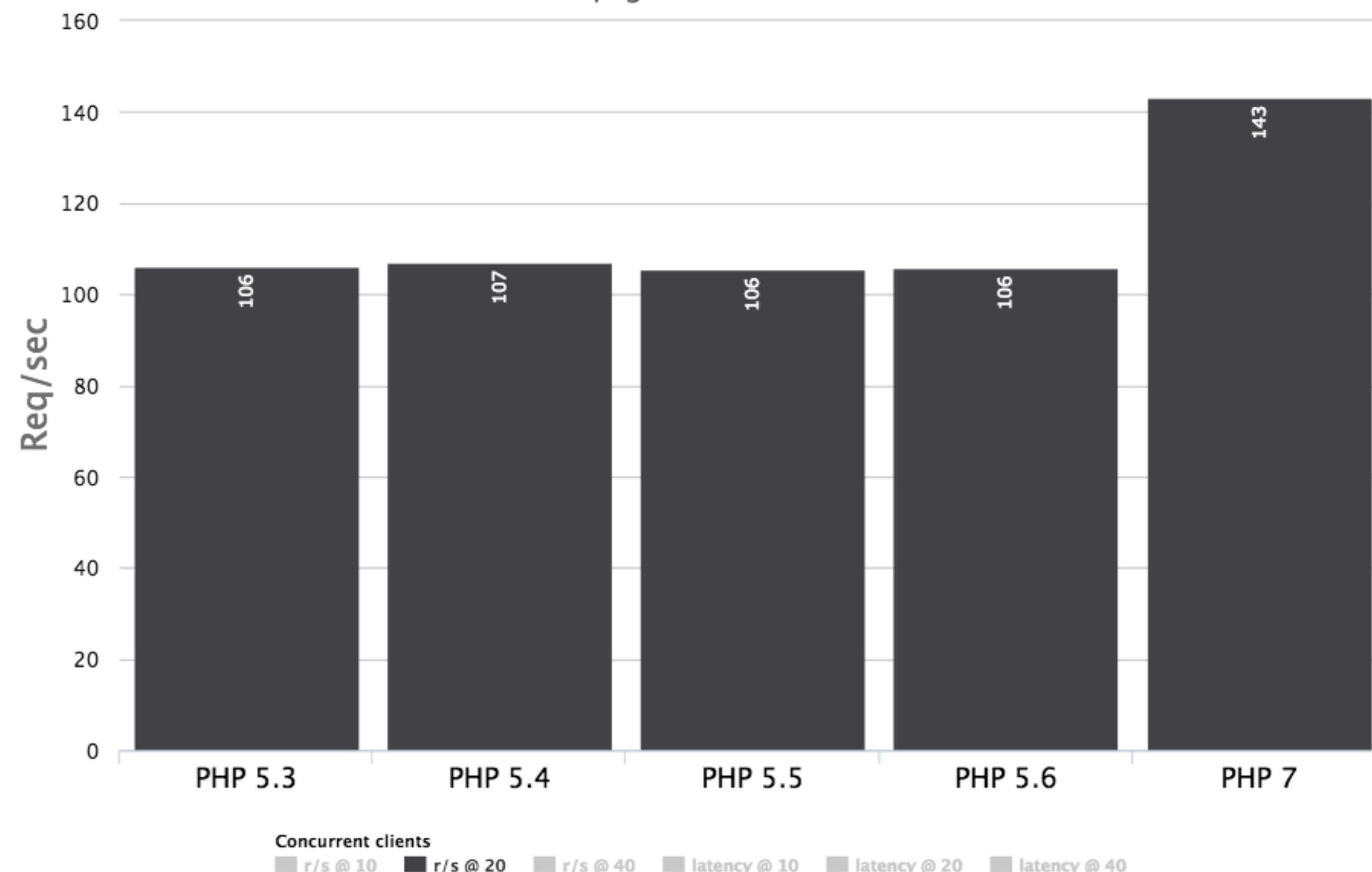
Moodle-2.9-dev

Hitting the default front page



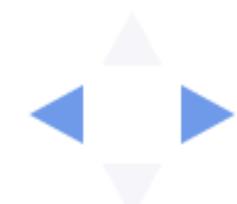
ZenCart 1.5.4

front page with demo data



Concurrent clients

r/s @ 10 r/s @ 20 r/s @ 40 latency @ 10 latency @ 20 latency @ 40



HELP US TEST!



IT IS REALLY EASY!

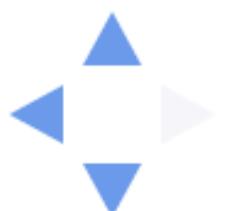


Install Vagrant and Virtualbox

Then:

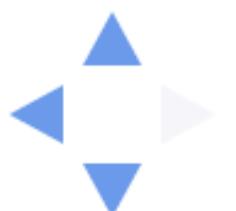
```
$ git clone https://github.com/rlerdorf/php7dev.git  
$ cd php7dev  
  
$ vagrant up  
... (takes a bit - it is downloading 1.5G)  
  
$ vagrant ssh
```

It will NAT, DHCP and also has a fixed address of
192.168.7.7



<http://192.168.7.7/> will show you the PHP 7 `phpinfo()` page

Now you have a working Rasmus-approved dev box on
your network



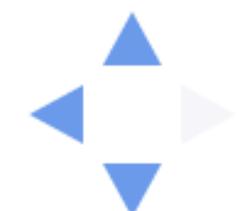
Switching PHP versions is trivial

```
vagrant@php7dev:~$ newphp 56
Activating PHP 5.6.6-dev and restarting php-fpm

vagrant@php7dev:~$ newphp 7 debug
Activating PHP 7.0.0-dev and restarting php-fpm
```

20 pre-compiled versions

```
/usr/local/php53          /usr/local/php54-zts      /usr/local/php56-debug-zts
/usr/local/php53-debug      /usr/local/php55          /usr/local/php56-zts
/usr/local/php53-debug-zts  /usr/local/php55-debug     /usr/local/php70
/usr/local/php53-zts        /usr/local/php55-debug-zts  /usr/local/php70-debug
/usr/local/php54            /usr/local/php55-zts      /usr/local/php70-debug-zts
/usr/local/php54-debug       /usr/local/php56          /usr/local/php70-zts
/usr/local/php54-debug-zts  /usr/local/php56-debug
```



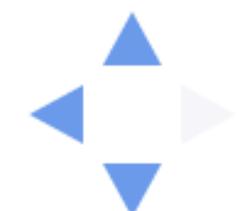
Build any version

```
$ makephp 7
Build log in /tmp/build.log
Building PHP 7.0
configuring...
compiling...
installing...
done
Building PHP 7.0-debug
configuring...
compiling...
installing...
done
```



or manually

```
$ cd php-src  
$ git checkout PHP-5.6  
$ git pull -r  
$ make distclean  
$ ./buildconf -f  
$ ./cn56  
$ make  
$ sudo make install
```



github.com/rlerdorf/php7dev

Report Bugs

Useful bug reports, please!

