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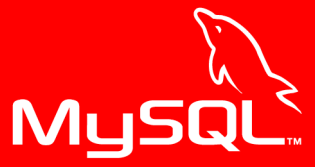

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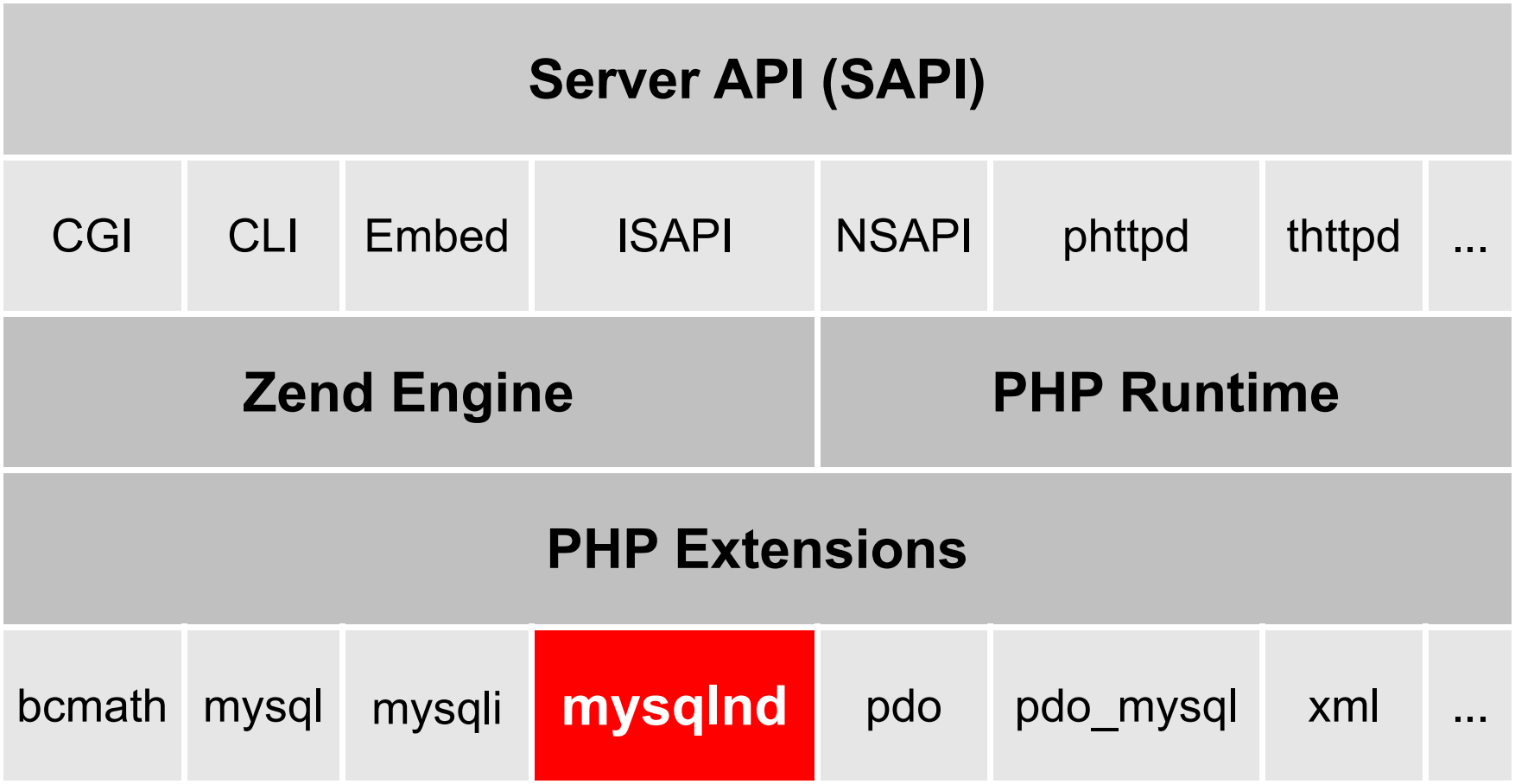
MySQL Client Side Caching

Johannes Schlüter
Twitter: @phperror
MySQL Engineering – Connectors and Client Connectivity

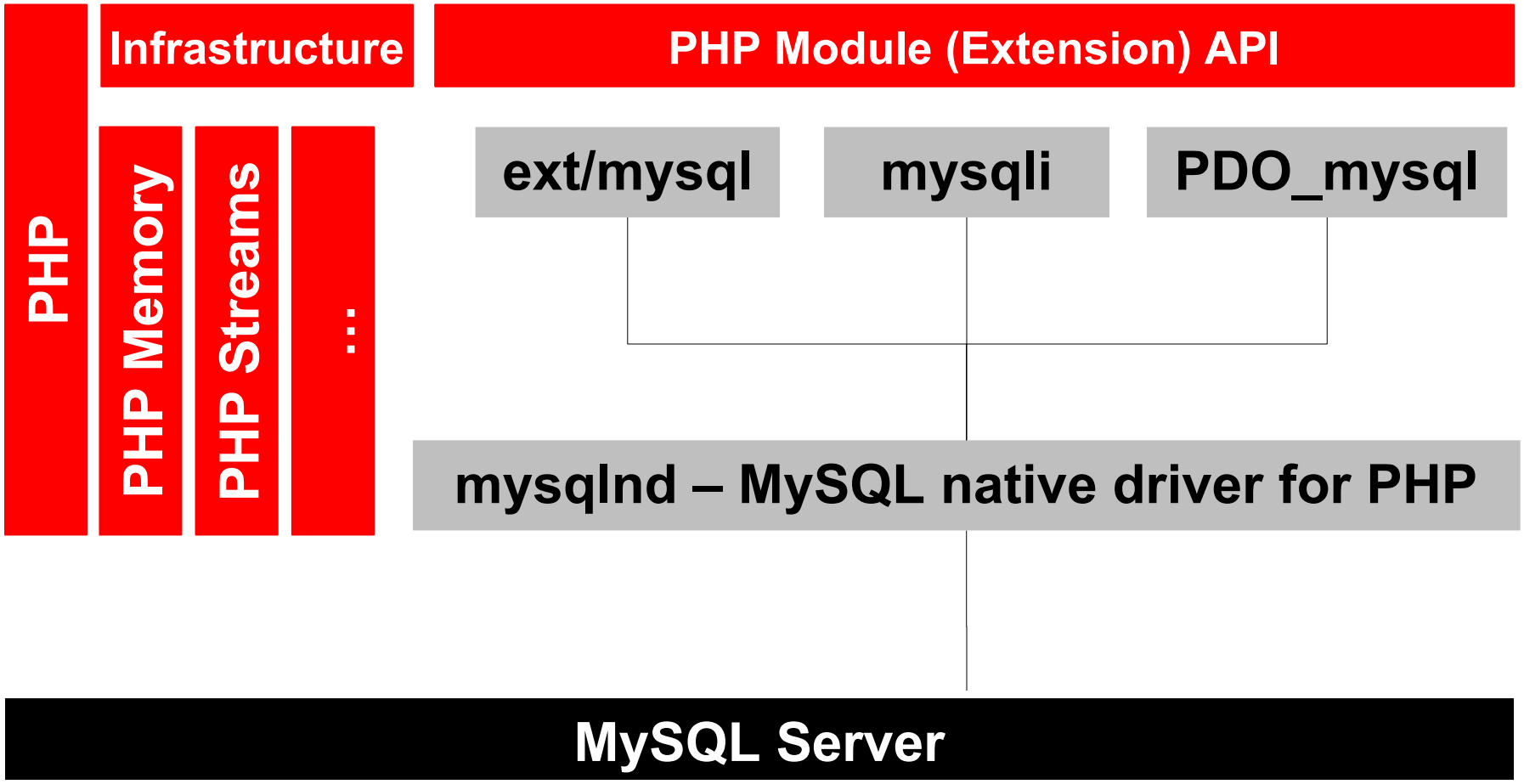
```
# pecl install mysqlnd_qc-beta
```

Gracias por vuestra atención!

mysqlnd


Server API (SAPI)
CGI
CLI
Embed
ISAPI
NSAPI
phttpd
thttpd
...
Zend Engine
PHP Runtime
PHP Extensions
bcmath
mysql
mysqli
mysqlnd
pdo
pdo_mysql
xml
...

PHP 5.3 and mysqlnd



Building PHP with mysqlnd

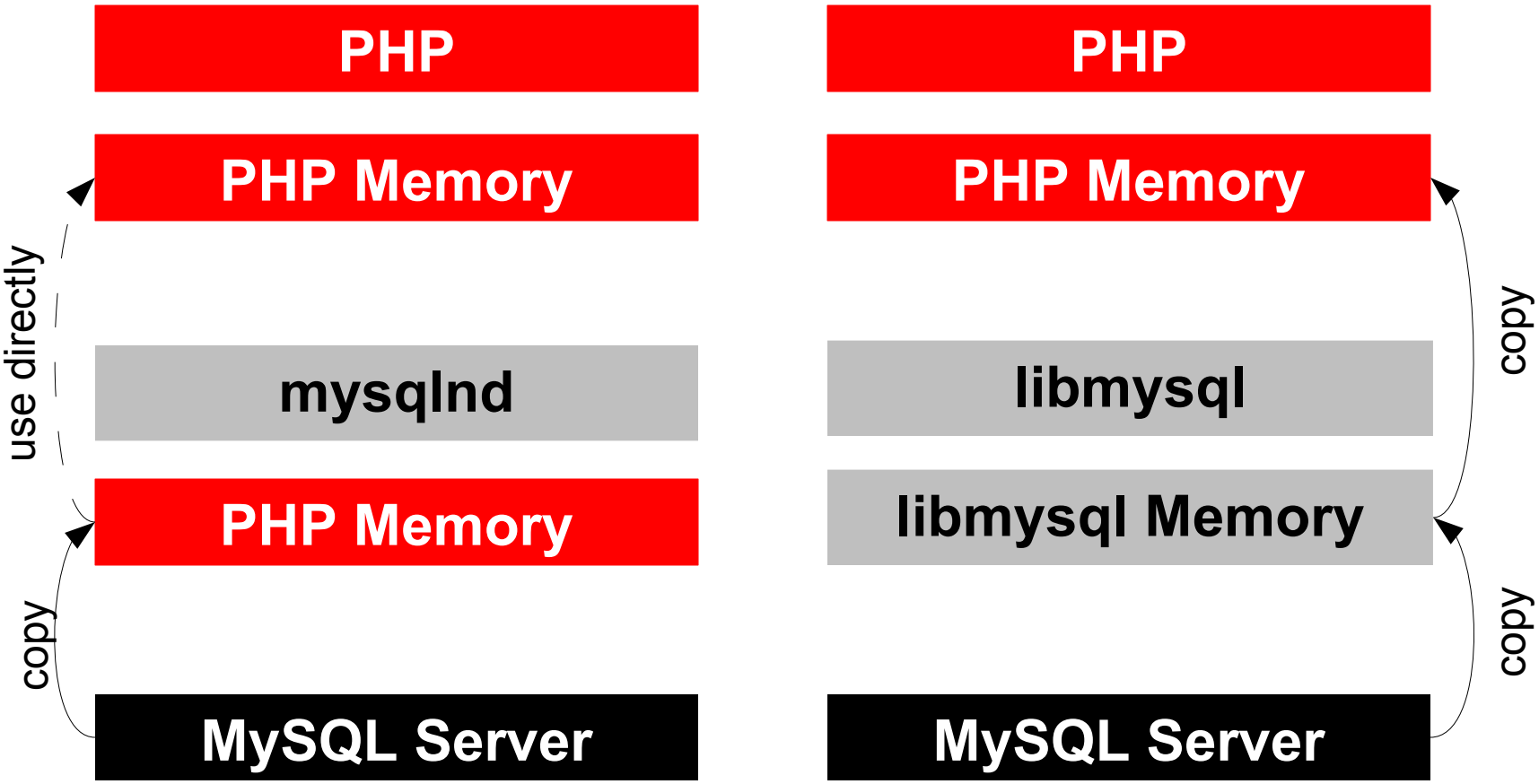
- ./configure \
  --with-mysql=mysqlnd \
  --with-mysqli=msqlnd \
  --with-pdo-mysql=mysqlnd

- Default on Windows and some distributions

mysqli

Mysqli Support	enabled
Client API library version	mysqlnd 5.0.7-dev - 091210 - $Revision: 296270 $
Active Persistent Links	0
Inactive Persistent Links	0
Active Links	9

mysqlnd vs. libmysql



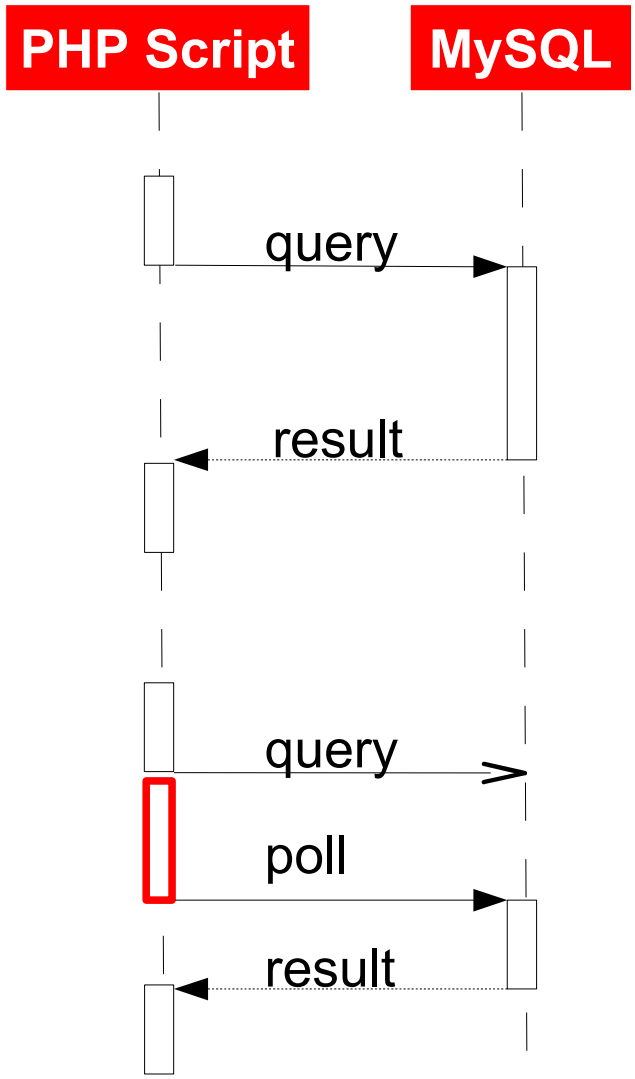
mysqlnd Statistics

Client statistics	
bytes_sent	5381679
bytes_received	39375881
packets_sent	16117
packets_received	469633
protocol_overhead_in	1878532
protocol_overhead_out	64468
bytes_received_ok_packet	18436
bytes_received_eof_packet	67682
bytes_received_rset_header_packet	68915
bytes_received_rset_field_meta_packet	8416202
bytes_received_rset_row_packet	30690198
bytes_received_prepare_response_packet	0
bytes_received_change_user_packet	0
packets_sent_command	15279
packets_received_ok	1676
packets_received_eof	13522

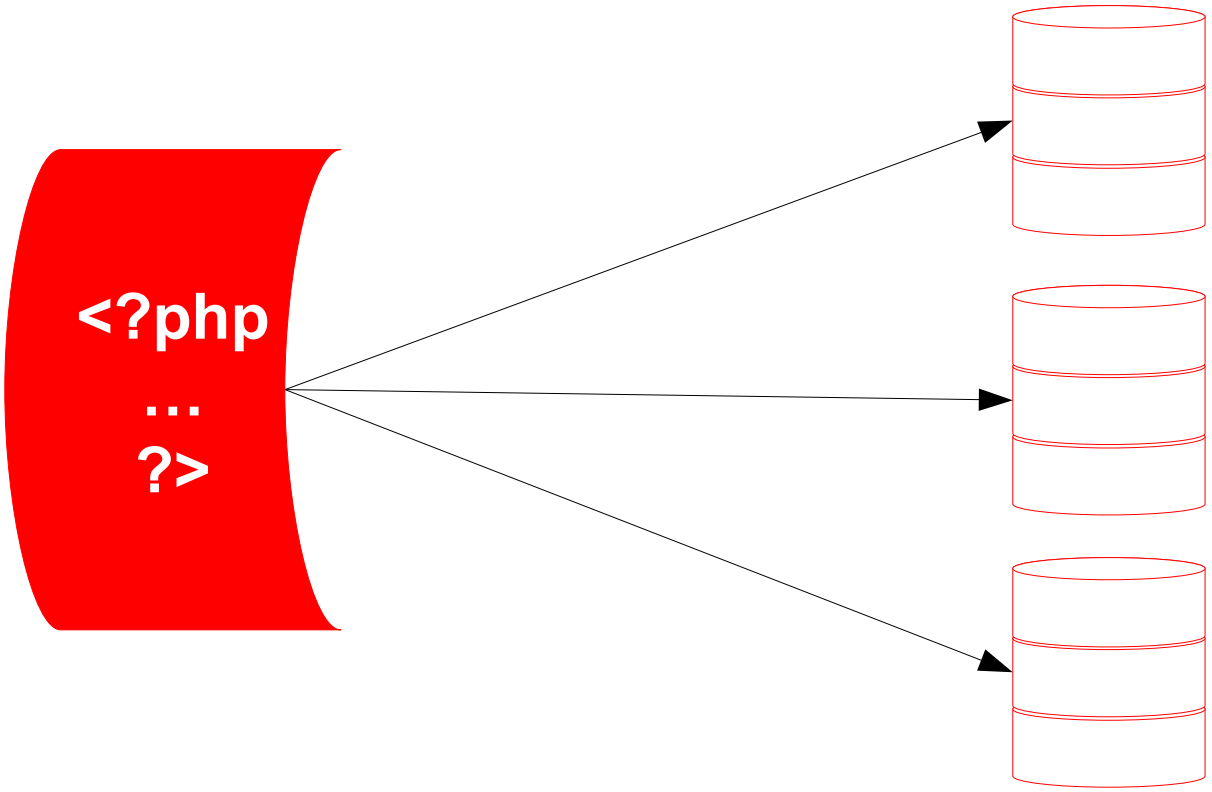
- Around 150 statistic values collected
- mysqli_get_client_stats (), mysqli_get_connection_stats()

Asynchronous Queries

```
$conn = new MySQLi(...);
$conn->query(
      "SELECT * FROM t WHERE ....",
      MYSQLI_ASYNC);

/* Do something */

mysqli_poll($links, $errors, $reject, 1);

/* Process query results */
```



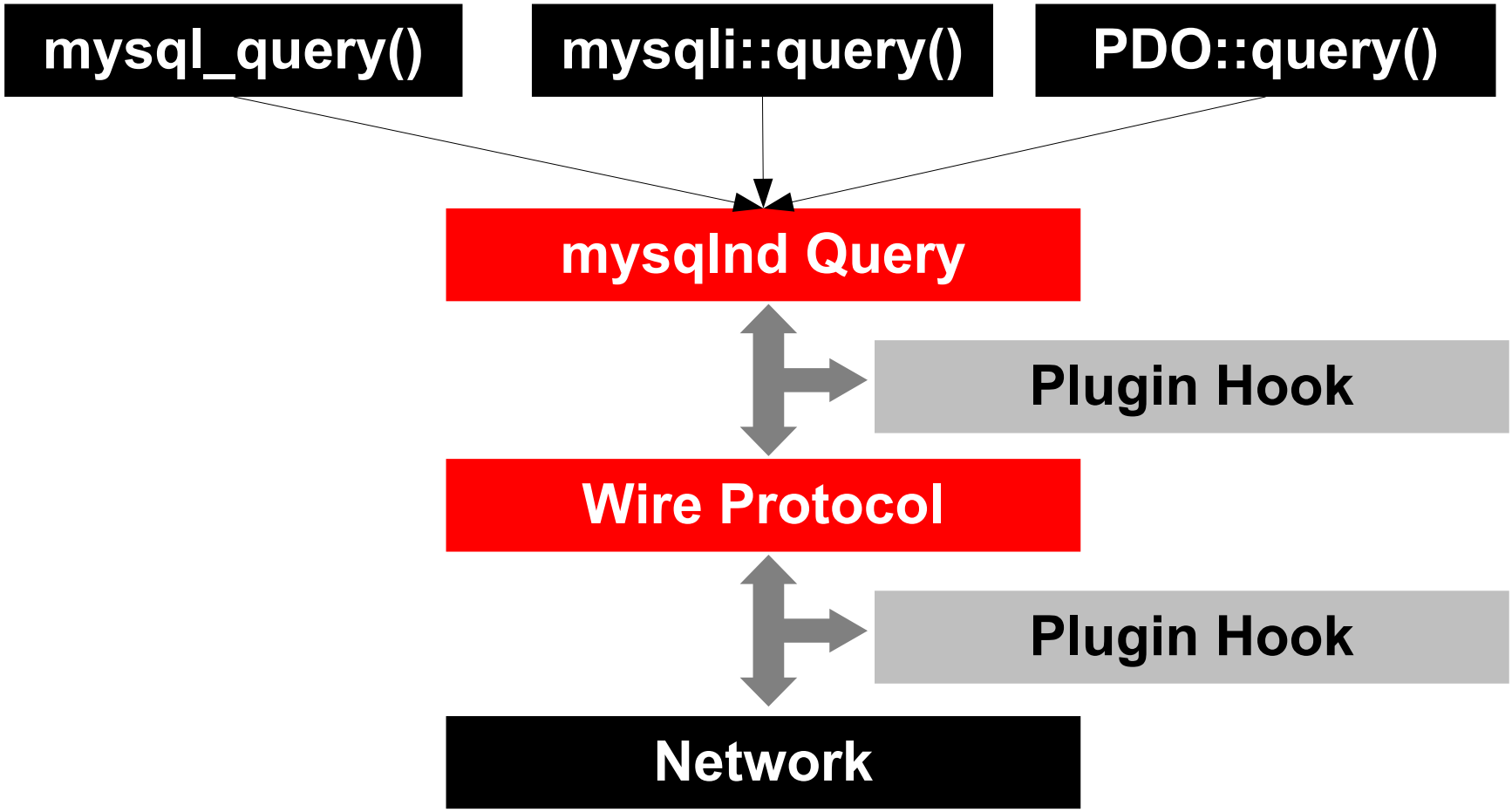
Sharding

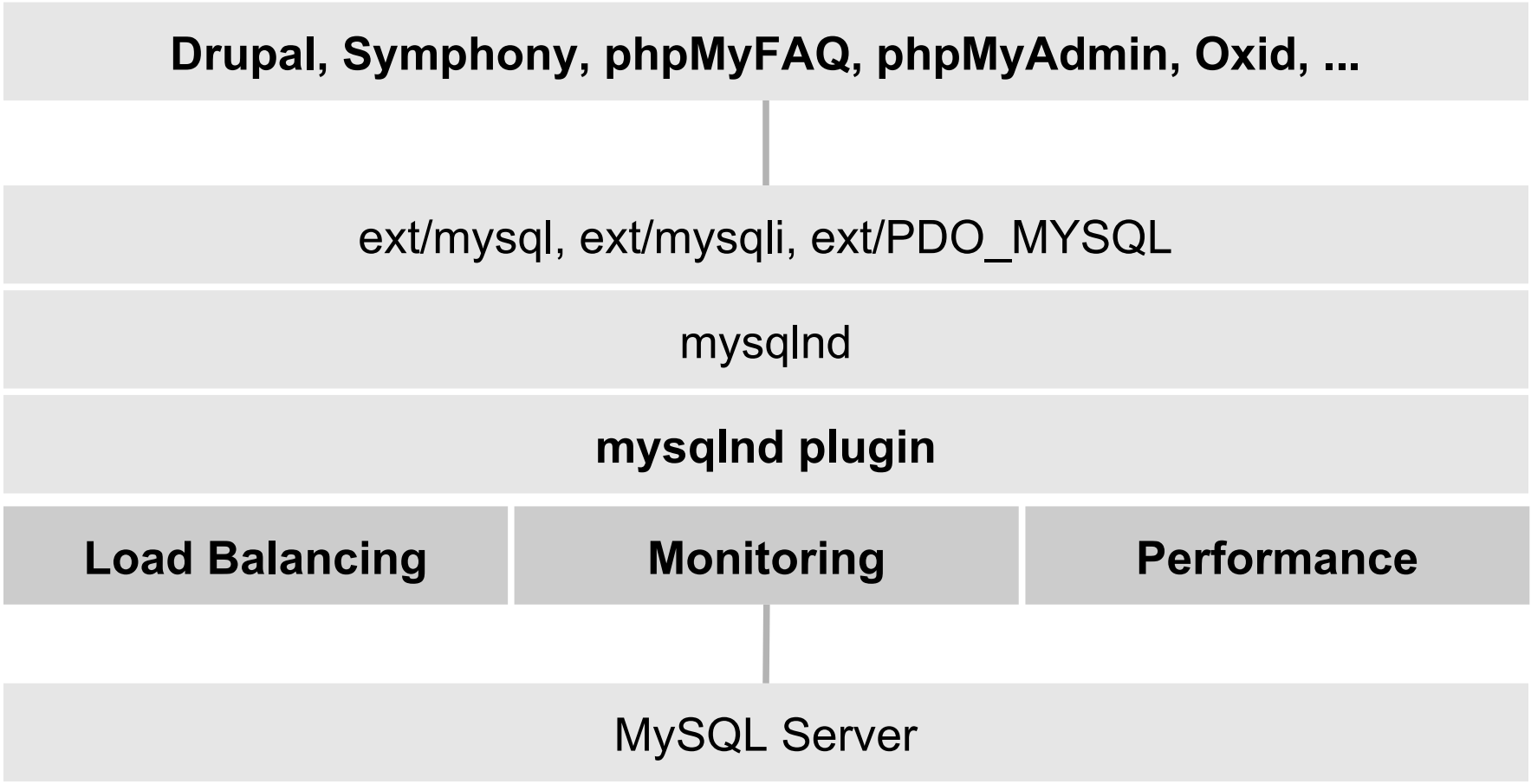


Sharding

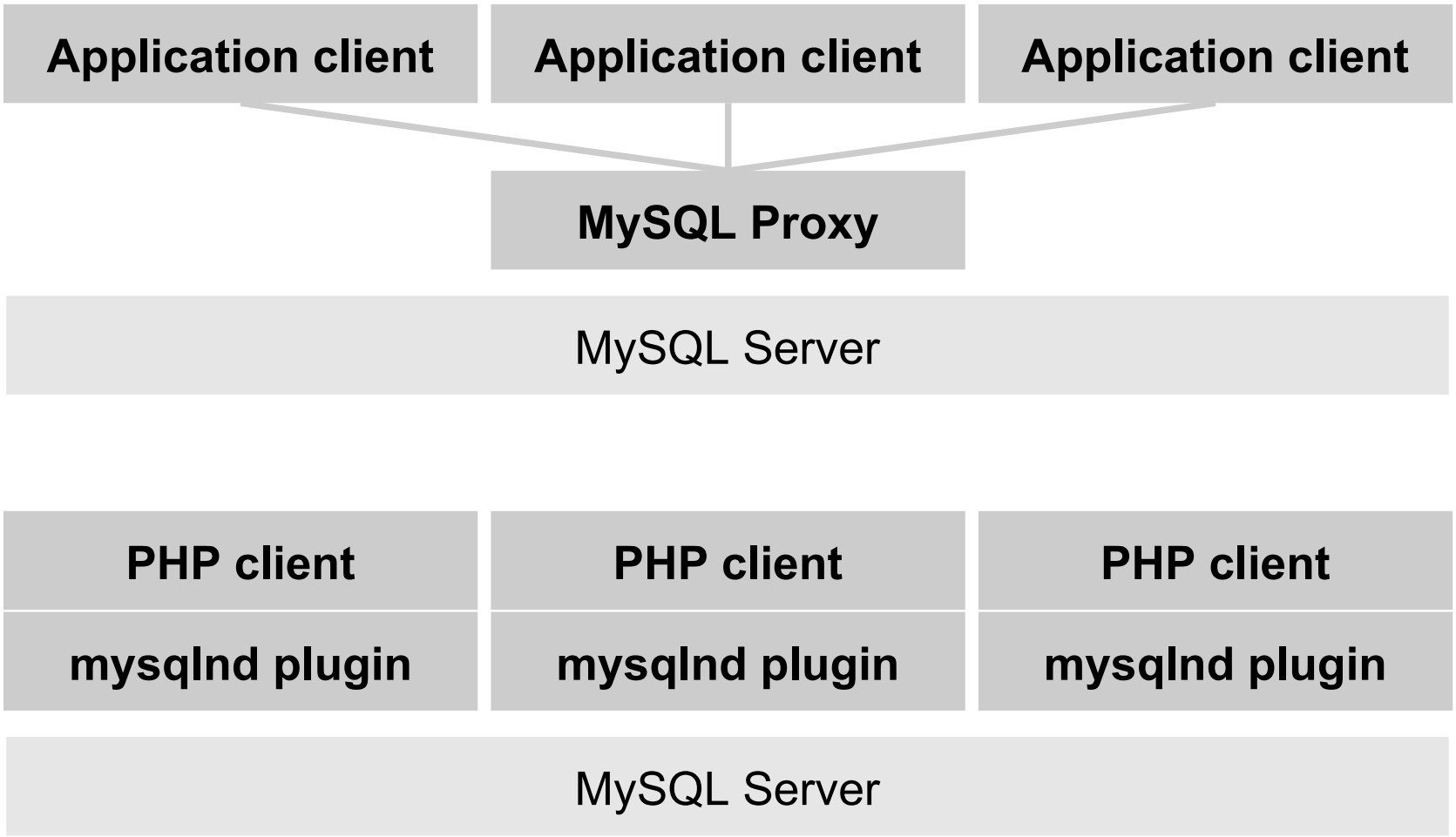
```
foreach ($all_links as $link)
    $link->query("SELECT 'test' ", MYSQLI_ASYNC);

$processed = 0;
do {
    $links = $all_links;
    if (!mysqli_poll($links, $errors, $reject, 1))  continue; /* TIMEOUT */

    foreach ($links as $link) {
        if ($result = $link->reap_async_query()) {
            print_r($result->fetch_row());
            mysqli_free_result($result);
            $processed++;
        }
    }
} while ($processed < count($all_links));
```

mysqlnd plugins

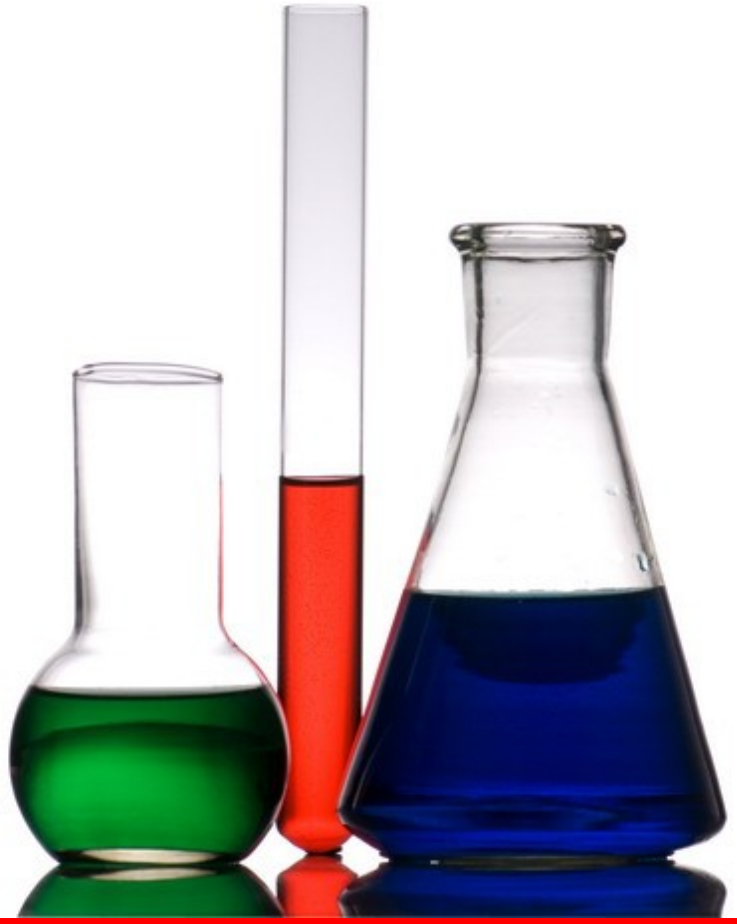



Drupal, Symphony, phpMyFAQ, phpMyAdmin, Oxid, ...
ext/mysql, ext/mysqli, ext/PDO_MYSQL
mysqlnd
mysqlnd plugin
Load Balancing
Monitoring
Performance
MySQL Server

Query Cache Plugin vs. MySQL Proxy

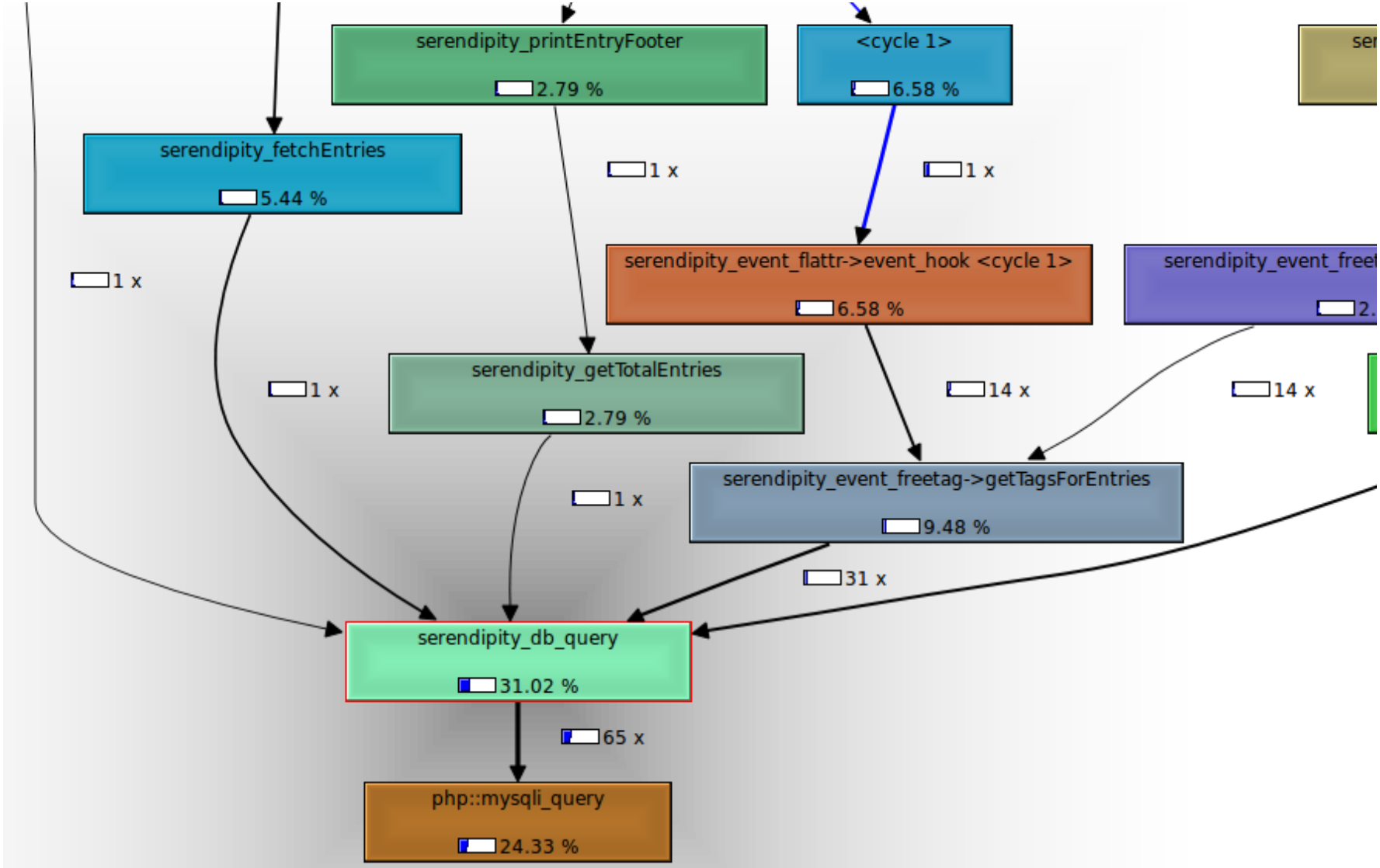


Experimental Extensions



- By Oracle:
  - mysqlnd_sip
  - mysqlnd_mc
  - mysqlnd_ms
  - mysqlnd_pscache
- By Community:
  - mysqlnd_uh (David Soria Parra / Mayflower GmbH)
- http://pecl.php.net/

The Database Is The Bottleneck



Caching!

“Traditional” Caches

- MySQL Server Cache
  - MySQL Query Cache
- Application-Level Cache
  - PEAR::Cache, Zend_Cache, …

MySQL Query Cache (Server-Side)

- ✔ Integrated with the MySQL Server
- ✔ No application changes
- ✔ Automatic invalidation
  - table based

- ✗ Needs network communication with server
- ✗ Needs server resources (memory, CPU)

Application-Level Caches

- ✔ Can cache higher level structures
  - Complete rendered HTML blocks
- ✔ Multiple backends
  - Can be shared over multiple servers (via memcache etc.)

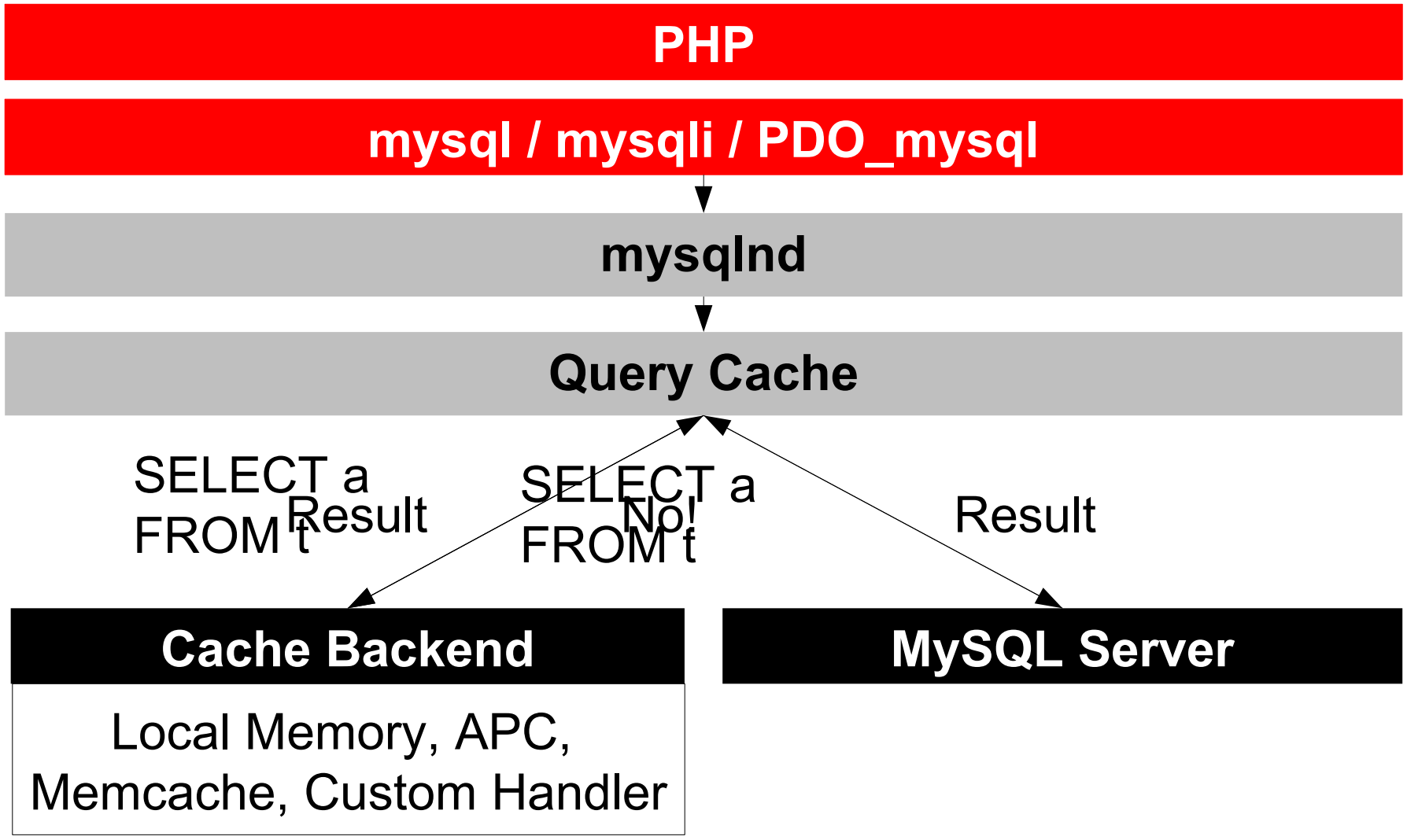
- ✗ No automatic invalidation
- ✗ Requires application changes

Introducing:
mysqlnd Client Side Cache

pecl install mysqlnd_qc-beta

Andrey Hristov
Ulf Wendel

mysqlnd Query Cache



Key Properties

- Transparent
  - PHP Extension hooking into mysqlnd
    - Works with ext/mysql, mysqli, pdo_mysql
- Pluggable storage handler
  - By default: local memory, APC, memcache, SQLite
  - PHP Userspace
- Invalidation via TTL
  - No automatic invalidation by server
  - Custom handlers may use custom invalidation logic

Transparent?

```
$mysqli = new mysqli($host, $user, $pw, $db);
$sql = “SELECT SLEEP(10) FROM table”;

$start = microtime(true);

$res = $mysqli->query($sql);
$res = $mysqli->query($sql);

$end = microtime(true);
echo $end - $start;
```

→ 20.019539117813

Transparent?

```
$mysqli = new mysqli($host, $user, $pw, $db);
$sql = sprintf("/*%s*/SELECT SLEEP(10) FROM table",
                MYSQLND_QC_ENABLE_SWITCH);

$start = microtime(true);

$res = $mysqli->query($sql);
$res = $mysqli->query($sql);

$end = microtime(true);
echo $end - $start;
```

→ 10.142804088593

Transparent!

mysqlnd_qc.cache_by_default = 1

! Usually you should NOT do this!

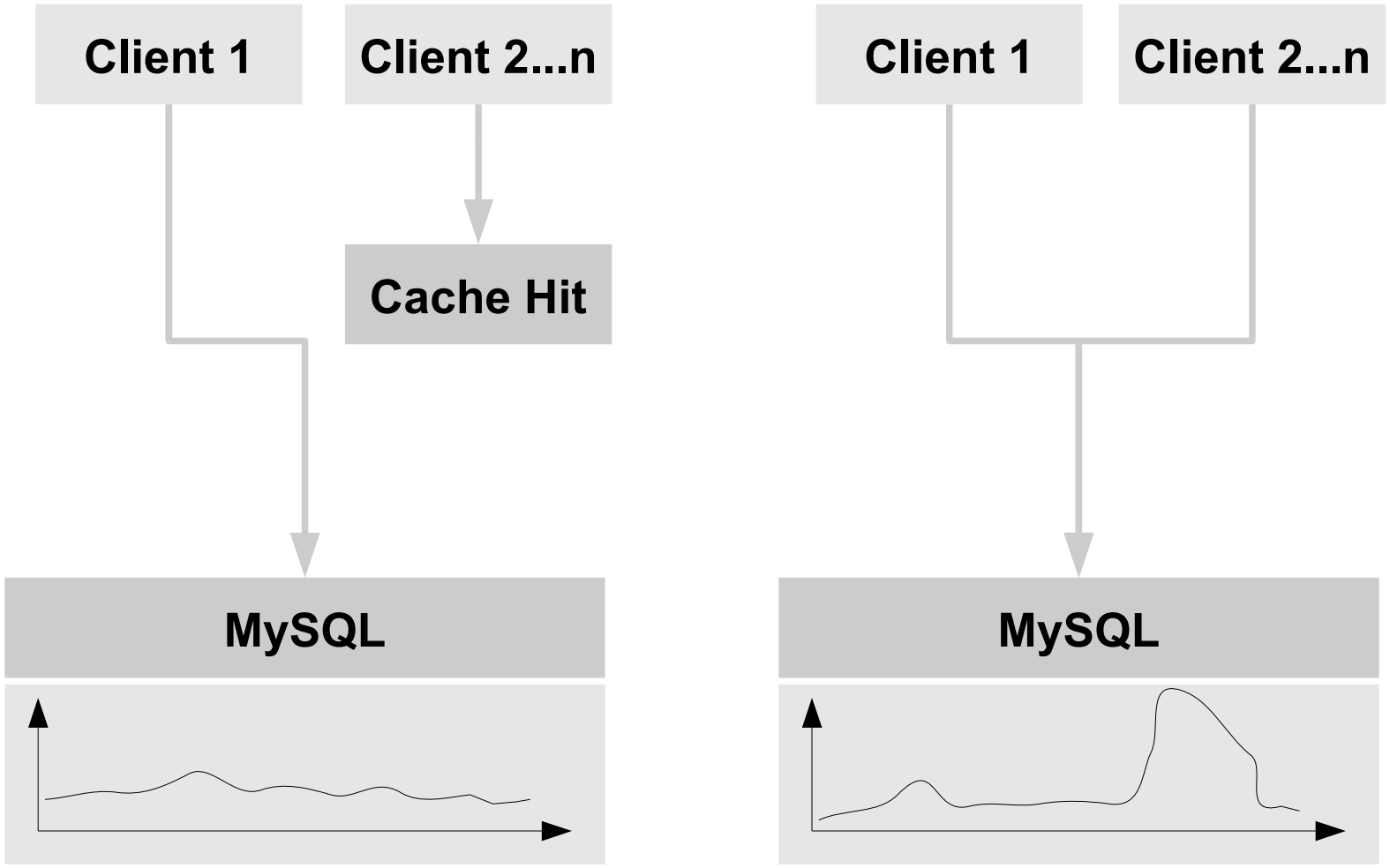
SQL Hints

- MYSQLND_QC_ENABLE_SWITCH
  - qc=on
- MYSQLND_QC_DISABLE_SWITCH
  - qc=off
- MYSQLND_QC_TTL_SWITCH
  - qc_ttl=

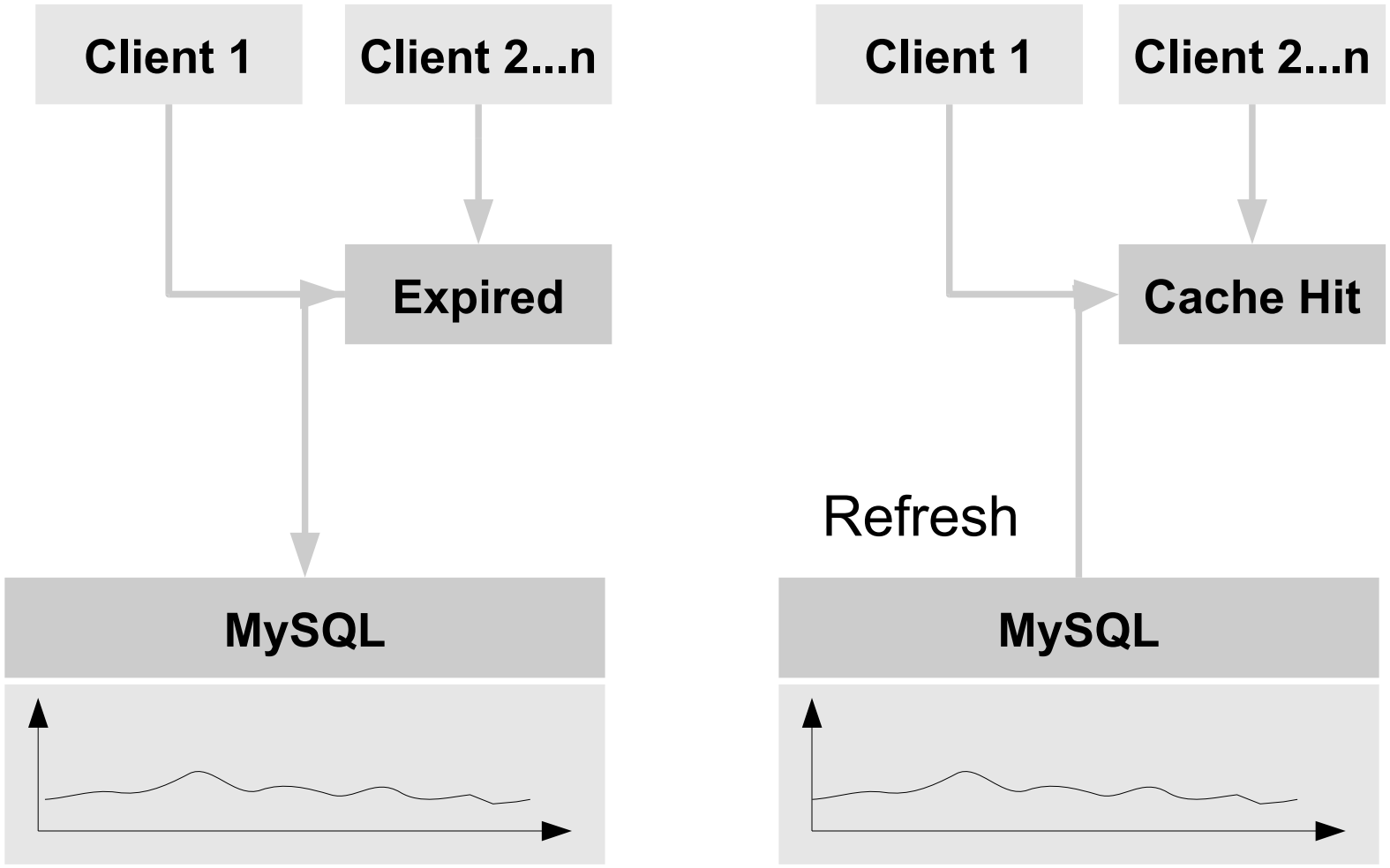
Storage Handlers

- **Storage**
  - Scope: request, process, machine, multi-machine
  - Location: distance to cache
  - Replacement strategy
  - Slam defense strategy
- **Decide what to cache**
  - is_select() - detect SQL hints
- **Extended statistics**
  - Storage statistics, traces, timings

Cache Expiry



Slam Defense



Core Statistics

- Collected by: mysqlnd_qc core
  - php.net/manual/en/function.mysqlnd_qc_get_core_stats.php
- Scope: process
  - Process: mysqlnd_qc_get_core_stats()
  - Aggregated values from all PHP MySQL APIs
- Contents: wide range
  - Cache usage and efficiency
  - Network related
  - Timings

Query Statistics and Backtraces

- Collected by: mysqlnd_qc core
  - php.net/manual/en/function.mysqlnd_qc_get_query_trace_log.php
- Scope: process
  - mysqlnd_qc_get_query_trace_log()
  - mysqlnd_qc_get_normalized_query_trace_log()
- Contents
  - Origin - backtrace
  - Timings

Storage Handler Statistics

- Collected by: storage handler
  - php.net/manual/en/function..mysqlnd_qc_get_cache_info.php
- Scope: cache entry
  - Depends on storage handler scope
  - Aggregated values from all PHP MySQL APIs
- Contents: none or assorted
  - Depends on storage handler support
  - APC: timings, hit ratio, result set size
  - Default: APC plus result set meta data

User-Defined Storage Handler

- Procedural
  - php.net/manual/en/function.mysqlnd_qc_set_user_handlers.php
  - Callback functions
- Object oriented
  - slideshare.net/nixnutz/mysqlnd-query-cache-plugin-userdefined-storage-handler
  - Interface mysqlnd_qc_handler
- Extending mysqlnd_qc_handler_default

```
<?php
/* auto_prepend_file = /path/to/prepend.php */

class my_qc extends mysqlnd_qc_handler_default
{
  public function is_select($query)
  {
    if (preg_match("@from employees where@ism", $query))
    {
      /* cache query for mysqlnd_qc.ttl seconds */
      return true;
    }
    return parent::is_select($query);
  }
}

$qc = new my_qc();
mysqlnd_qc_change_handler($qc);
?>
```

Resources

- php.net/mysqlnd_qc
  - Installation, Examples, Functions
- php.net/mysqlnd
  - Introduction, Changes, C plugin API
- slideshare.net/nixnutz/presentations
  - QC Basics
  - QC User defined storage handler
  - QC Statistics
  - QC Benchmark impressions

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