

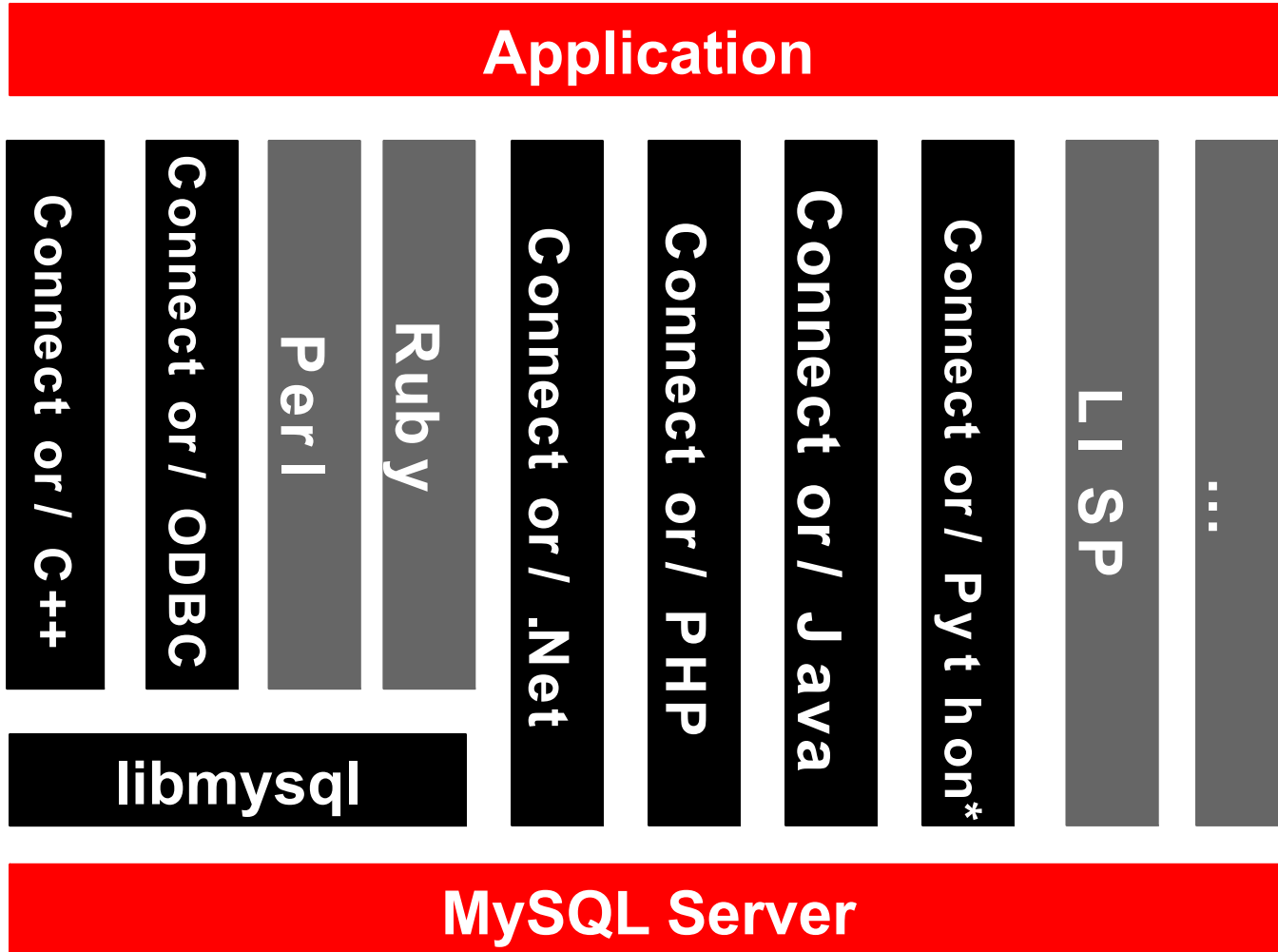


MySQL mysqlnd PHP driver

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MySQL Connectors



PHP mysqlnd driver

- MySQL PHP drivers part of the PHP distribution
- Part of the php.net project
- Three APIs (mysql, mysqli, pdo_mysql) and one base library (mysqlnd)
- <http://php.net>

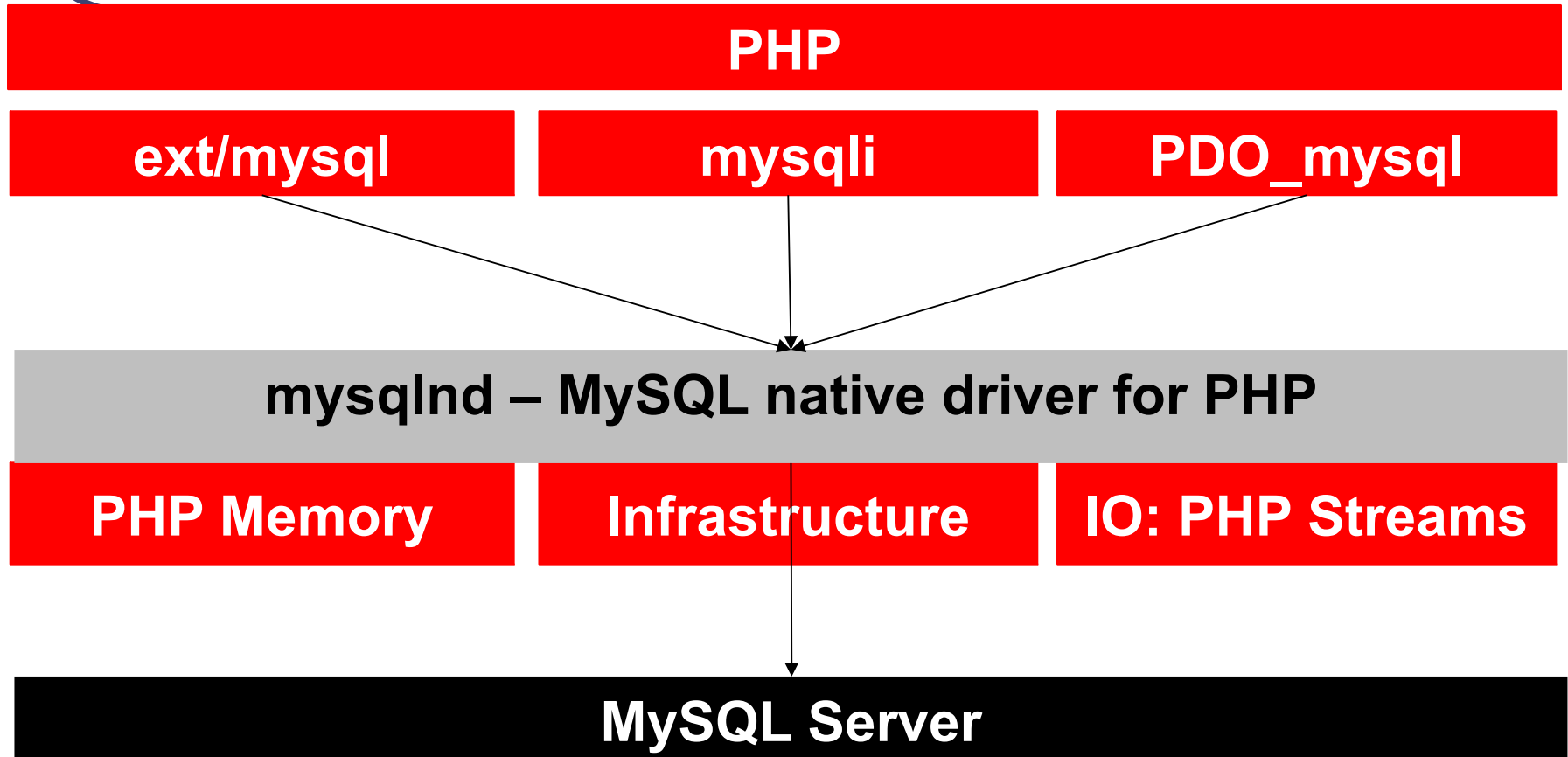




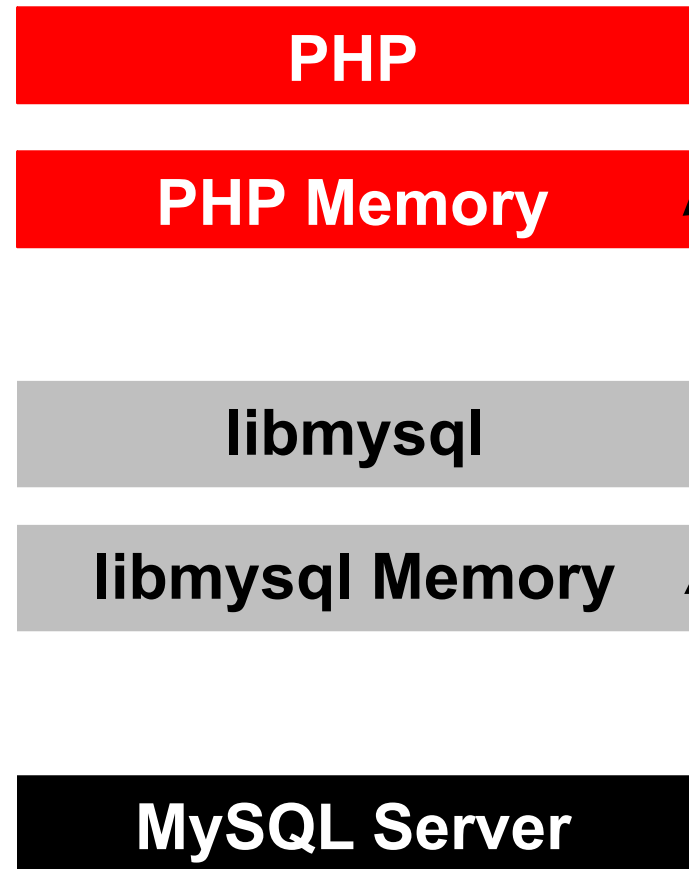
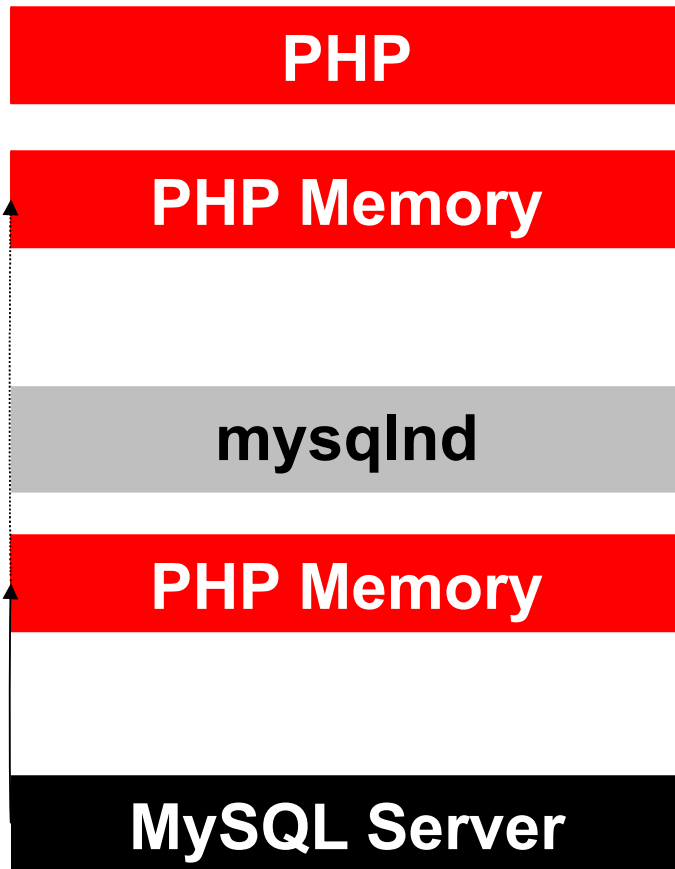
PHP mysqlnd driver

- No MySQL compile dependency
- No MySQL client runtime dependency
- Extensible
- Available in 5.3, default in 5.4+

PHP and mysqlnd



libmysql vs. mysqlnd



Mysqli embeds new mysqlnd enhancements

Key mysqli extension benefits compare to the mysql extension :

- Object-oriented interface
- Support for Prepared Statements
- Support for Multiple Statements
- Support for Transactions
- Enhanced debugging capabilities
- Embedded server support

Mysqli API PHP Example

```
<?php
$connection = mysqli_connect('localhost', 'root', '', 'test');
if (!$connection) {
    die('Error: ' . mysqli_connect_error());
}
$result = mysqli_query($connection,
    'SELECT first_name, last_name FROM
    employees LIMIT 5');

if (!$result) {
    die('Error: ' . mysqli_error());
}

echo "<table>\n";
while ($row = mysqli_fetch_assoc($result)) {
    printf("<tr><td>%s</td><td>%s</td></tr>\n",
        htmlentities($row['first_name']),
        htmlentities($row['last_name'])
    );
}
echo "</table>\n";
mysqli_free_result($result);
mysqli_close($connection);
?>
```


Mysqlnd install

Building PHP with mysqlnd

- `./configure \`
 - `--with-mysql=mysqlnd \`
 - `--with-mysqli=mysqlnd \`
 - `--with-pdo-mysql=mysqlnd`
- Default on Windows and some distributions
- On linux distrib Incompatibility between pkgs
 - `php-mysqlnd-5.3.10-1.fc16.x86_64.rpm`
 - `php-mysql- ...`

Mysqlnd / few dependencies

```
$ rpm -ql php-mysqlnd-5.3.13-1.fc16.x86_64
```

```
/etc/php.d/mysqlnd.ini  mysqlnd_mysqlnd.ini  
  pdo_mysqlnd.ini
```

```
/usr/lib64/php/modules/mysqlnd.so mysqlnd_mysqlnd.so  
  pdo_mysqlnd.so
```

```
$ ldd pdo_mysqlnd.so
```

```
linux-vdso.so.1 => (0x00007fff64f96000)
```

```
libc.so.6 => /lib64/libc.so.6 (0x00007f28de038000)
```

```
/lib64/ld-linux-x86-64.so.2 (0x0000003dae000000)
```

MysqInd features level

Special features compare to MySQL Client Library :

- » Improved persistent connections
- » The special function `mysqli_fetch_all()`
- » Performance statistics calls: `mysqli_get_cache_stats()`,
`mysqli_get_client_stats()`,
`mysqli_get_connection_stats()`

Mysqlnd features level

SSL Support

MySQL Native Driver supports SSL since PHP 5.3.3

Compressed Protocol Support

As of PHP 5.3.2 MySQL Native Driver supports the compressed client server protocol.

Note that PDO_MYSQL does NOT support compression when used together with mysqlnd.

Named Pipes Support

Named pipes support for Windows was added in PHP version 5.4.0.

Mysql asynchronous query - only with mysqlnd -

```
<?php
```

```
...
```

```
$link1->query("SELECT 'test'",  
    MYSQLI_ASYNC);
```

```
...
```

```
if (!mysqli_poll($links, $errors, $reject, 1)) {
```

```
...
```

```
$result = $link->reap_async_query();
```

```
...
```

```
?>
```

client per-process statistics - only with mysqlnd -

- Around 150 statistic values collected
 - `mysqli_get_client_stats ()`
 - `mysqli_get_connection_stats()`
- Check PS Execution Ratio
 - `$stats = mysqli_get_client_stats();`
`echo $stats['com_execute'] / $stats['com_prepare'];`
- Check for unprocessed rows
 - `$mysqli->close();`
`$stats = mysqli_get_client_stats();`
`echo $stats['rows_skipped_normal'];`

Do more with mysqlnd plugins

`mysql_query()`

`mysqli::query()`

`PDO::query()`

mysqlnd Query

Plugin Hook

Wire Protocol

Plugin Hook

Network



mysqlnd Plugins

- “mysqlnd client proxy”
 - Load Balancing
 - Read / Write splitting
 - Failover
 - Monitoring
 - Query Logging
 - Query Auditing
 -

Performance

- Caching
- throttling
- Sharding
- Memcached
- multiplexing

MySQL mysqlnd and PECL :: The PHP Extension Community Library

- mysqlnd_ms
 - (ms for master/slave) A replication and load balancing plugin for mysqlnd
- mysqlnd_qc A query cache plugin for mysqlnd
- mysqlnd_uh mysqlnd Userland Handler
- mysqlnd_mux connection multiplexing plugin
- mysqlnd_memcache memcache plugin

mysqlnd Query Cache

PHP

mysql / mysqli / PDO_mysql

mysqlnd

Query Cache

Cache Backend

Local Memory, APC,
Memcache, Custom Handler

MySQL Server

mysqlnd Query Cache Key Properties

- Transparent or hints
 - 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

mysqlnd Query Cache Transparent ?

```
$mysqli = new mysqli($host, $user, $pw, $db);
```

```
$sql = sprintf("/*%s*/SELECT SLEEP(10) FROM table"
```

```
MYSQLND_QC_ENABLE_SWITCH);
```

...

Or

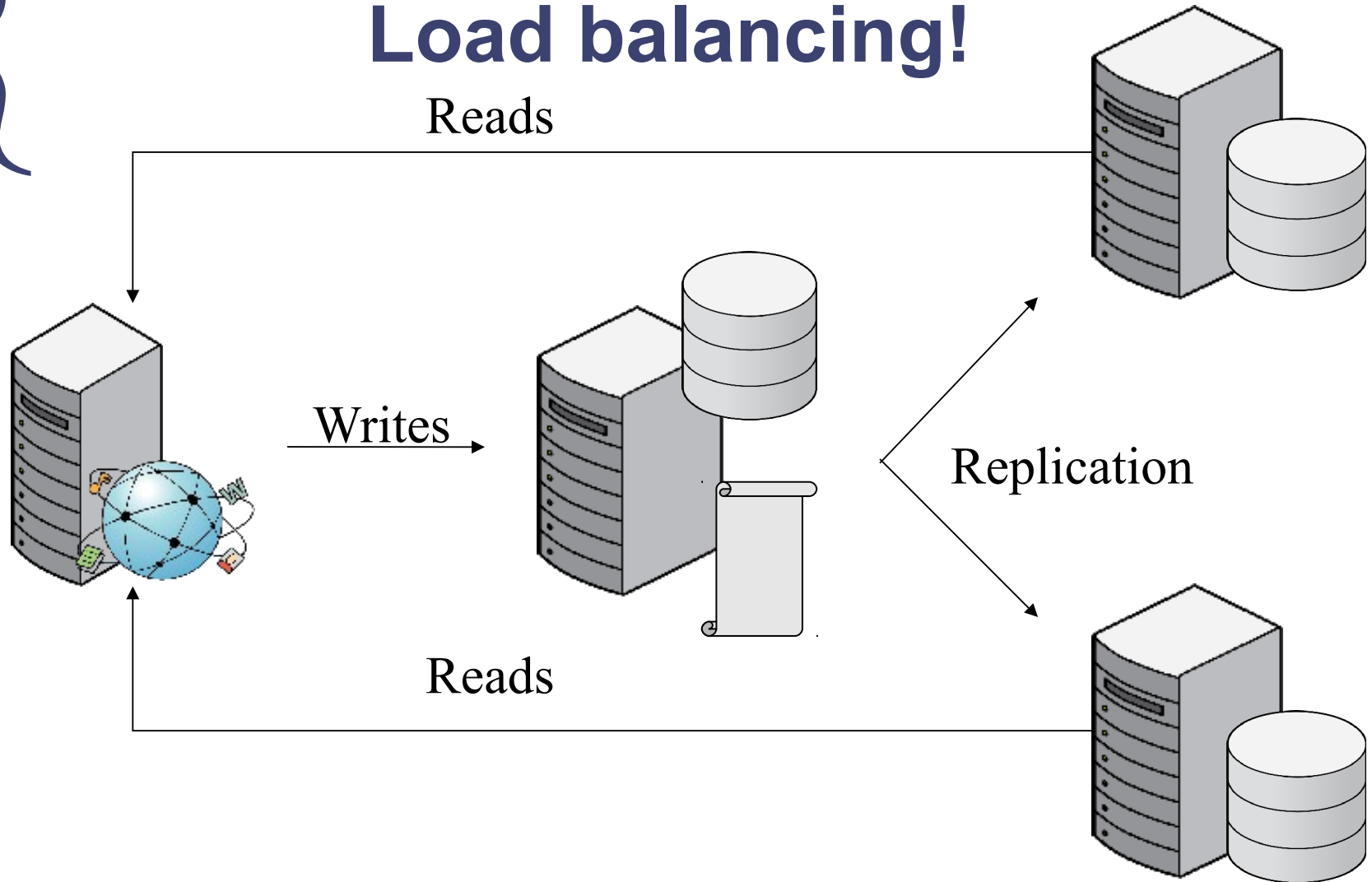
...

```
mysqlnd_qc.cache_by_default = 1
```

! Usually you should NOT do this!



mysql_ms Load balancing!



mysqlnd_ms

Application

mysql_query()

mysqli::query()

PDO::query()

mysqlnd_ms

Master

Slave(s)



mysqlnd_ms Configuration

```
"myapp": {  
  "master": {  
    "master_0": {  
      "host": "localhost",  
      "socket": "/tmp/mysql.sock"  
    }  
  },  
  "slave": {  
    "slave_0": {  
      "host": "192.168.2.27",  
      "port": "3306"  
    }  
  }  
}
```

mysqlnd_ms: Connecting

```
$mysqli = new MySQLi("myapp", "user", "pwd");  
$pdo = new PDO("mysql:host=myapp", "user", "pwd");  
$mysql = mysql_connect("myapp", "user", "pwd");  
  
$mysqli->query("SELECT * FROM t");  
    $mysqli->query("SET @sessionvar='value' ");  
    $mysqli->query("SELECT @sessionvar");
```


Connection-Pooling: Fail-Over

- Default
 - No failover, error
- Possible
 - Automatic fail-over
- Warning:
State changes!

mysqlnd_ms Quality of Service

mysqlnd_ms is a load balancer at the driver level

controlled by :

- SQL hints
- **mysqlnd_ms_set_qos()** defines the quality of service (QoS). tells load balancer how to select database cluster nodes .

Without **GTIDs** the rules for a MySQL Replication cluster are simple:

- eventual consistency – any slave, session
- strong consistency – master only.



mysqlnd_ms 1.5 + PHP 5.5.0 + MySQL 5.6
= better load balancing

2 possibilities :

- hint the load balancer about transaction boundaries
- monitor API calls controlling transactions

`mysqli_begin_transaction()`,



Benefit from MySQL 5.6 read only transactions

For 5.6 : very important !

```
$mysql->begin_transaction(
```

```
– MYSQLI_TRANS_START_READ_ONLY);
```



mysql_uh

writing mysqlnd plugin in php !

David Soria Parra (lead)

Ulf Wendel

myslqnd_uh for what ?

- Monitoring

Queries executed by any of the PHP MySQL extensions

Prepared statements executing by any of the PHP MySQL extensions

- Auditing

Detection of database usage

SQL injection protection using black and white lists

- Assorted

Load Balancing connections

mysqlnd_uh how ?

- Two classes are provided by the extension: `MysqlndUhConnection` and `MysqlndUhPreparedStatement`.

`MysqlndUhConnection` lets you access almost all methods of the `mysqlnd` internal connection class.

`MysqlndUhPreparedStatement` exposes some selected methods of the `mysqlnd` internal statement class



mysqlnd_mux

operate transparently from a user perspective.

Supports all of the PHP MySQL extensions.

Pooling reduces connection establishment latency

Reduces # connections to the MySQL server.

- horizontal scale-out (scale-by-client).

1:n relationship between internal network connection and user connection handles.

Persistent connection.



mysqlnd_memcache

PHP extension for transparently translating SQL into requests for the MySQL InnoDB Memcached Daemon Plugin (5.6 server plugin).

Write your own mysqlnd plugin !

A mysqlnd plugin is itself a PHP extension.

A mysqlnd plugin works by intercepting calls made to mysqlnd by extensions that use mysqlnd.

This is achieved by obtaining the mysqlnd function table, backing it up, and replacing it by a custom function table, which calls the functions of the plugin as required.



Questions



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