



Debugging from the Trenches

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Don't do it in production !



**When the BUG
comes up**

**DON'T PANIC
Be yourself**



Debugging mindset

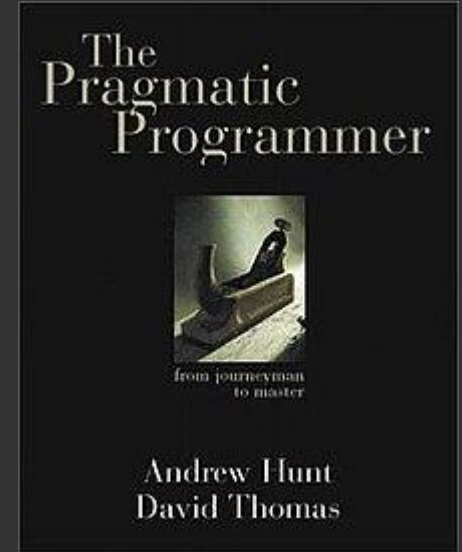
- Fix the Problem, Not the Blame.
- Don't Assume It – Prove It.
- The best way to start fixing a bug is to make it reproducible.
- Now what happens before and after.
- Don't Live with Broken Windows. (The Boy Scout Rule)
- Explain the bug to someone else. ([Rubber duck](#))
- Stay aware of what you're doing.
- Understand Stack Traces
- Test Your Software, or Your Users Will.
- A bad Unit Test is worse than No Test. Robert C. Martin (Uncle Bob).
- Ask yourself questions.

Debugging checklist

- Is the problem being reported a direct result of the underlying bug, or merely a symptom?
- Is the bug really in the code? Is it in the OS? Or is it in third party packages?
- If you explained this problem in detail to a coworker, what would you say?
- If the suspect code passes its tests, are the tests complete enough? What happens if you run the test with this data?
- Do the conditions that caused this bug exist anywhere else in the system?

Debugging checklist

- Is there an easier way?
- Am I solving the right problem?
- Why is this a problem?
- What makes it hard?
- Do I have to do it this way?
- Does it have to be done at all?



https://en.wikipedia.org/wiki/The_Pragmatic_Programmer

**\$CFG->debug =
(E_ALL | E_STRICT);**

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Moodle Debug Developer

Dashboard / Site administration / Development / Debugging

Debugging

Debug messages
debug

DEVELOPER: extra Moodle debug messages for developers
Default: NONE: Do not show any errors or warnings

If you turn this on, then PHP's `error_reporting` will be increased so that more warnings are printed. This is only useful for developers.

Display debug messages
debugdisplay

☒ Default: Yes

Set to on, the error reporting will go to the HTML page. This is practical, but breaks XHTML, JS, cookies and HTTP headers in general. Set to off, it will send the output to your server logs, allowing better debugging. The PHP setting `error_log` controls which log this goes to.

Debug email sending
debugsmtp

☐ Default: No

Enable verbose debug information during sending of email messages to SMTP server.

Performance info
perfdebug

☒ Default: No

If you turn this on, performance info will be printed in the footer of the standard theme

Show origin of languages
strings
debugstringids

☐ Default: No

If enabled, language string components and identifiers are displayed when `?strings=1` or `&strings=1` is appended to the page URL.

Show validator links
debugvalidators

☐ Default: No

Enable if you want to have links to external validator servers in page footer. You may need to create new user with username `w3cvalidator`, and enable guest access. These changes may allow unauthorized access to server, do not enable on production sites!

Show page information
debugpageinfo

☒ Default: No

Enable if you want page information printed in page footer.

Save changes

Moodle Debug Developer

config.php

```
$CFG->debug = (E_ALL | E_STRICT); // === DEBUG_DEVELOPER
$CFG->debugdisplay = 1; // unless watch the logs.
$CFG->debugusers = '2,8'; // List of user ids that that always see debug messages.
$CFG->cachejs = false; // Prevent JS caching
$CFG->debugstringids = 1; // Show origin of languages strings
$CFG->langstringcache = false; // Disable language strings cache
$CFG->themedesignermode = true; // Disable CSS and image cacge
$CFG->divertallemailsto = 'root@localhost.local'; // Divert all outgoing emails to
this address
$CFG->noemailever = true; // no emails or other messages should ever be send to
real users
$CFG->divertallemailsexcept = 'tester@dev.com, fred(\+.*)?@example.com'; //
Send emails only for certain email addresses you want to let through for testing.
```

Moodle Debug Developer

```
$CFG->perfdebug = 15;  
$CFG->debugpageinfo = true;
```

config.php

You are logged in as Admin User ([Log out](#))
[Reset user tour on this page](#)
[Home](#)

4.016969 secs RAM: 8.5MB RAM peak: 9.5MB

Included 290 files Contexts for which filters were loaded: 0 Filters created: 3
Pieces of content filtered: 0 Strings filtered: 0 get_string calls: 282
DB reads/writes: 35/3 DB queries time: 0.28588 secs Load average: 2.17
Session (core\session\file): 7.5KB

Caches used (hits/misses/sets)

core/databasemeta [a] ** static acceleration **: 10 / 9 / 0 cachestore_file: 9 / 0 / 0	core/string [a] ** static acceleration **: 462 / 65 / 0 cachestore_file: 65 / 0 / 0	core/yulmodules [a] cachestore_file: 3 / 0 / 0	
core/plugin_manager [a] cachestore_file: 3 / 0 / 0	core/capabilities [a] ** static acceleration **: 311 / 1 / 0 cachestore_file: 1 / 0 / 0	core/plugin_functions [a] ** static acceleration **: 1 / 12 / 0 cachestore_file: 12 / 0 / 0	core/coursemodinfo [a] cachestore_file: 2 / 0 / 0
core/contextwithinsights [a] ** static acceleration **: 0 / 1 / 0 cachestore_file: 1 / 0 / 0	core/repositories [r] cachestore_static: 0 / 8 / 16	tool_usertours/tourdata [a] ** static acceleration **: 0 / 1 / 0 cachestore_file: 1 / 0 / 0	
core/fontawesomeselconmapping [a] ** static acceleration **: 0 / 1 / 0 cachestore_file: 1 / 0 / 0	core/langmenu [a] ** static acceleration **: 3 / 1 / 0 cachestore_file: 1 / 0 / 0	core/message_processors_enabled [a] ** static acceleration **: 0 / 1 / 0 cachestore_file: 1 / 0 / 0	
core/observers [a] ** static acceleration **: 0 / 2 / 0 cachestore_file: 2 / 0 / 0	tool_monitor/eventsubscriptions [a] ** static acceleration **: 0 / 2 / 0 cachestore_file: 2 / 0 / 0		

Total: 891 / 104 / 16
This page is: General type: course. Context Course: testS (context id 30). Page type course-view-topics.
[Purge all caches](#)

Debugging

PHP

```
if ($CFG->debugdeveloper) {  
    ...  
    debugging('Argument $record must be an instance of stdClass.', DEBUG_DEVELOPER);  
    ...  
}
```

JS

```
define(['core/log'], function(log) {  
    log.info(...);  
});  
$x() in web console useful to XPath queries
```

```
>> $x("//*[@data-region='count-container']")  
← (2) [...]   
  0: <div class="count-container" data-region="count-container" aria-label="There are 1 unread conversations">   
  1: <div class="count-container" data-region="count-container" aria-label="There are 1 unread notifications">   
    length: 2   
  <prototype>: Array []
```

Web inspector

Code Linting

<https://docs.moodle.org/dev/Linting>

PHP_CodeSniffer & Local_codechecker ([by Tim Hunt](#))
 JavaScript (ESLint) <https://eslint.org/>
 CSS/SCSS/LESS (stylelint) <https://stylelint.io/>
 Lint in Editors (Sublime, Atom, Vim, ...)

PHPXREF

<http://phpxref.sourceforge.net/>



Profiling

Dashboard / Site administration / Development / Profiling

- https://docs.moodle.org/dev/Profiling_PHP#Tideways_for_php7
- <https://tracker.moodle.org/browse/MDL-62280> (Tideways XHProf)

Dashboard / Site administration / Development / Profiling

Profiling

☒ Enable profiling
profilingenabled ☐ Default: No

If you enable this setting, then profiling will be available in this site and you will be able to define its behavior by configuring the next options.

Profile these
profilingincluded

Default: Empty

Integration Master

Dashboard / Site administration / Development / Profiling runs

Profiling runs

[Import]

URL	Date	Execution time	CPU time	Function calls	Memory used	Comment
/my/index.php	4 May 2018, 11:04	616.406 ms	203.928 ms	96462	5223.273 KB	

Integration Master

Dashboard / Site administration / Development / Profiling runs / /my/index.php

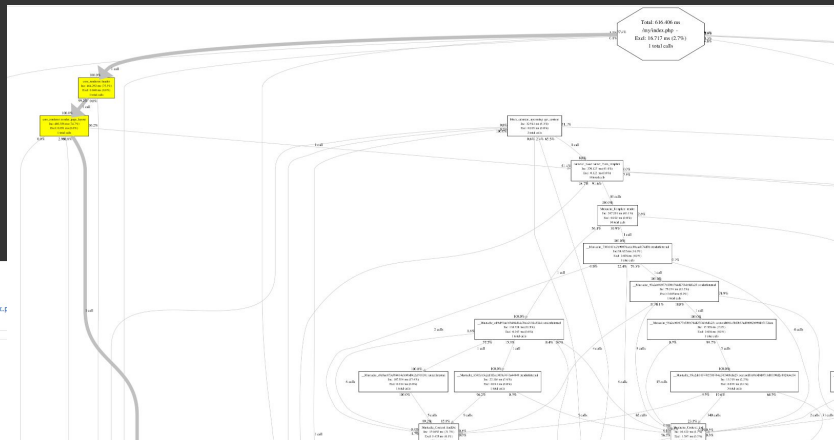
Summary of last run of /my/index.php

Run ID	2b52f308521f6240fcb8bcb0ec64c1
URL	/my/index.php
Date	4 May 2018, 11:04
Execution time	616.406 ms
CPU time	203.928 ms
Function calls	96462
Memory used	5223 KB

☐ Mark as reference implementation

[View profiling details](#)

[Export this profiling run](#)



Run tasks

***php admin/tool/task/cli/schedule_task.php
--execute="\tool_cohortroles\task\cohort_role_sync"
--showdebugging***

```
iMac-de-Carlos:stable_master carlosagile$ php admin/tool/task/cli/schedule_task.php --execute="\tool_cohortroles\task\cohort_role_sync" --showdebugging
[Execute scheduled task: Sync cohort role assignments (tool_cohortroles\task\cohort_role_sync)
Sync cohort roles...
Added 0
Removed 0
... used 2 dbqueries
... used 0.45213103294373 seconds
Scheduled task complete: Sync cohort role assignments (tool_cohortroles\task\cohort_role_sync)
```

Since Moodle 3.6:

php admin/tool/task/cli/adhoc_task.php --execute

```
iMac-de-Carlos:cli carlosagile$ php adhoc_task.php --execute --showdebugging
Server Time: Wed, 27 Jun 2018 22:24:39 +0200

Execute adhoc task: core\task\build_installed_themes_task
... started 22:24:39. Current memory use 11.1MB.
```

Web Service

CURL

curl

'http://localhost/m/stable_master/webservice/rest/server.php?moodlewsrestformat=json' --data

'wsfunction=tool_mobile_get_config&wstoken=08788646962394c92aab6c26a3be7abe§ion=mobileapp' | python -m "json.tool"

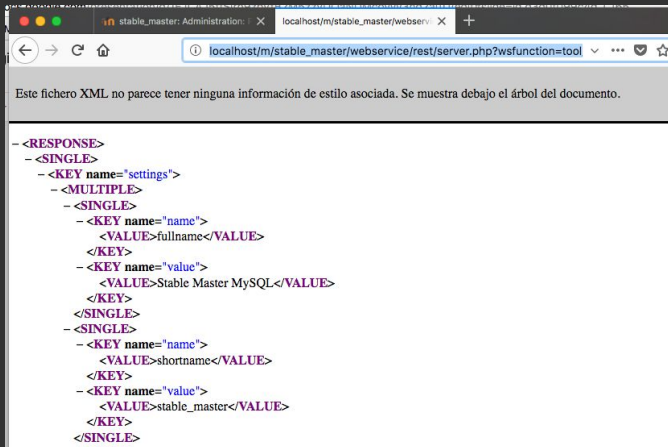
```
iMac-de-Carlos:tdc carlosagile$ curl 'http://localhost/m/stable_master/webservice/rest/server.php?moodlewsrestformat=json' --data 'wsfunction=tool_mobile_get_config&wstoken=08788646962394c92aab6c26a3be7abe&section=mobileapp' | python -m "json.tool"
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             %       Dload  Upload  Total    Spent    Left  Speed
100  375  100    283   100    92    336    109  --:--:-- --:--:-- --:--:--  445
{
  "settings": [
    {
      "name": "tool_mobile_forcelogout",
      "value": false
    },
    {
      "name": "tool_mobile_customlangstrings",
      "value": false
    },
    {
      "name": "tool_mobile_disabledfeatures",
      "value": false
    },
    {
      "name": "tool_mobile_custommenuitems",
      "value": false
    },
    {
      "name": "tool_mobile_apppolicy",
      "value": ""
    }
  ],
  "warnings": []
}
```

Web Service

BROWSER

`http://localhost/m/stable_master/webservice/rest/server.php?wsfunction=tool_mobile_get_config&wstoken=08788646962394c92aab6c26a3be7abe`

`http://localhost/m/stable_master/webservice/rest/simpleserver.php?wsusername=wstest&wspassword=wstest&wsfunction=core_user_create_users&users[0][username]=moote sdev&users[0][firstname]=Test&users[0][lastname]=MootWS&users[0][email]=mootesdev@moodle.com&users[0][password]=12345&users[0][customfields][0][type]=cp&users[0][customfields][0][value]=08208`



Web Service Resources

WS API https://docs.moodle.org/dev/Web_services_API

Dev Docs

https://docs.moodle.org/dev/Creating_a_web_service_client

MoodleHQ WS Clients:

<https://github.com/moodlehq/sample-ws-clients>

Juan Leyva Master of WS

<http://es.slideshare.net/juanleyva/mastering-moodle-web-services-development>

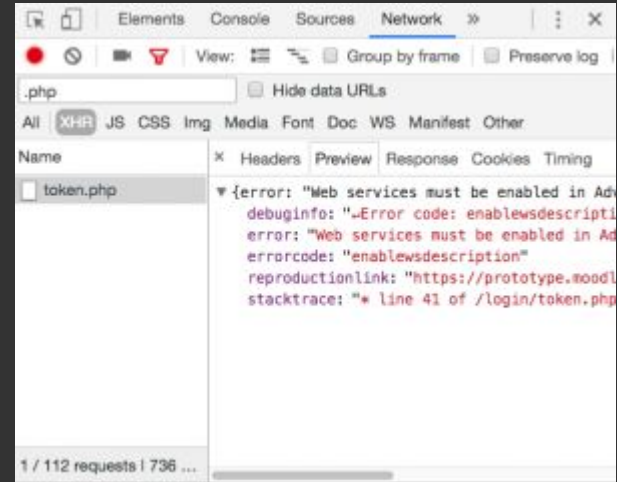
Moodle Mobile

Debugging WS Request

https://docs.moodle.org/dev/Moodle_Mobile_debugging_WS_requests

Use an online web version of the app that can be easily debugged using the Chrome browser.

<https://prototype.moodle.net/mobile/webapp/>



Development using Chrome or Chromium

https://docs.moodle.org/dev/Moodle_Mobile_development_using_Chrome_or_Chromium

ionic serve --browser chromium

Docker to the rescue

LDAP

```
docker run -p 389:389 --name my-openldap-container --hostname  
ldap.example.org --env LDAP_REPLICATION=true --detach  
osixia/openldap:1.2.0
```

```
docker run -p 6443:443 --name phpldapadmin-service --link  
my-openldap-container:ldap-host --env  
PHPLDAPADMIN_LDAP_HOSTS=ldap-host --detach osixia/phpldapadmin:0.7.1
```

You can go to <https://localhost:6443/> in your browser
login: cn=admin,dc=example,dc=org
password: admin

<https://tracker.moodle.org/browse/MDL-61296>

Moodle Docker

<https://github.com/moodlehq/moodle-docker>

moodle-docker: Docker Containers for Moodle Developers

build passing

This repository contains Docker configuration aimed at Moodle developers and testers to easily deploy a testing environment for Moodle.

Features:

- All supported database servers (PostgreSQL, MySQL, Microsoft SQL Server, Oracle XE)
- Behat/Selenium configuration for Firefox and Chrome
- Catch-all smtp server and web interface to messages using [MailHog](#)
- All PHP Extensions enabled configured for external services (e.g. solr, ldap)
- All supported PHP versions
- Zero-configuration approach
- Backed by [automated tests](#)

Oracle Example

```
export MOODLE_DOCKER_WWWROOT=/Home/dev/htdocs/moodleoracle
export MOODLE_DOCKER_DB=oracle
cp config.docker-template.php $MOODLE_DOCKER_WWWROOT/config.php
bin/moodle-docker-compose up -d
bin/moodle-docker-wait-for-db
```

Expose local servers to internet

NGROK (<https://ngrok.com/>)

- Allows you to expose your local instance to the world
- Creates a tunnel that diverts all web traffic for the given url to your localhost.
- Extremely helpful when testing/developing features that require postback to your Moodle instance.
 - For ex.: LTI, Paypal integration, OAuth verification etc.

```
ngrok by @inconshreveable

Session Status      online
Session Expires    7 hours, 57 minutes
Version            2.2.8
Region             United States (us)
Web Interface       http://127.0.0.1:4040
Forwarding          http://[redacted] -> localhost:80
Forwarding          https://7be57f55.ngrok.io -> localhost:80

Connections
  ttl   opn   rt1   rt5   p50   p90
    9    0    0.13  0.03  7.03  23.20

HTTP Requests
-----
POST /m/stable_master/lib/ajax/service.php 200 OK
GET /m/stable_master/theme/yui_combo.php 200 OK
GET /m/stable_master/lib/javascript.php/1529600956/lib/jquery/jquery-3.2.1.min.js 200 OK
GET /m/stable_master/lib/requirejs.php/1529600956/core/first.js 200 OK
GET /m/stable_master/theme/yui_combo.php 200 OK
GET /m/stable_master/lib/javascript.php/1529600956/lib/requirejs/require.js 200 OK
GET /m/stable_master/theme/image.php/boost/core/1529600956/i/course 200 OK
GET /m/stable_master/theme/image.php/boost/core/1529600956/moodlelogo 200 OK
GET /m/stable_master/theme/image.php/boost/theme/1529600956/favicon 200 OK
GET /m/stable_master/theme/font.php/boost/core/1529600956/fontawesome-webfont.woff2 200 OK
```

Dynamic ngrok configuration with MDK

- Created by Andrew Nichols
- How to configure it:
 - Copy ngrok.php file into the MDK Storage Directory
 - Place ngrok.sh into the MDK Local Scripts Directory (typically *~/.moodle-sdk/scripts*)
 - Create an ngrok Authentication according to the [ngrok Documentation](#)
 - Place the ngrokrunner script in your path and make it executable
- How to use it:
 - Add a line to the config.php to load a custom ngrok configuration

```
$ mdk run ngrok
```

- Start ngrok with custom configuration of port, subdomain, and region

```
$ ngrokrunner
```

MDK - Moodle Development Kit

- <https://github.com/FMCorz/mdk> developed by Frédéric Massar
- https://docs.moodle.org/dev/Moodle_Development_kit

#update mdk

```
sudo pip install --upgrade moodle-sdk
```

#your mdk config file.

```
./moodle-sdk/config.json
```

#place where save script that you want to run like mdk run SCRIPT

```
./moodle-sdk/scripts
```

#upgrade your Moodle instances

```
mdk upgrade --all --update
```

#config your master branch

```
mdk config set masterBranch 37
```

#install a new instance of Moodle

```
mdk create -v master -n stable_master -i --run users mindev
```

#install a new integration instance of Moodle

```
mdk create -v 34 -n int34 --integration -i --run users mindev
```

MDK - Moodle Development Kit

#create a new branch MDL-56141-master-test

mdk pull MDL-56141 -t

#run phpunit tests and init the environment

mdk phpunit -r -u mod/assign/tests/locallib_test.php

#run behat tests and init the environment

mdk behat -r --tags=@message_popup

#install community plugins

mdk plugin install tool_policy

#create a new clean branch MDL-61575-master

mdk fix 61575

MDK - Moodle Development Kit

#force push the commits.

```
mdk push -t -f
```

#do the magic backport

```
mdk backport -v 36
```

#Rebase your local branches

```
mdk rebase --issues 65015 --version master --push
```

#Uninstall a plugin also delete the directory

```
mdk plugin uninstall <pluginname>
```

Created by Adrian Greeve

<https://github.com/abgreeve/mdk/tree/plugin-uninstall>

GDPR Privacy Utils for testing

https://docs.moodle.org/dev/Privacy_API/Utilities

Scripts to:

- Test of privacy API compliance
- Test of exporting user data
- Test of deleting user data

Save the scripts into .moodle-sdk/scripts

Run scripts with `$mdk run testcompliance.php`

```
iMac-de-Carlos:stable_master carlosagile$ mdk run testcompliance.php
/usr/bin/git remote -v
/usr/bin/git config --get remote.origin.url
Running 'testcompliance.php' on 'stable_master'
Copying /Users/carlosagile/.moodle-sdk/scripts/testcompliance.php to /Users/carlosagile/dev/private/m/stable_master/moodle/mdkscriptrun1..php
The following plugins are not compliant:
=> local_moodlecheck

Testing the compliant plugins:
== antivirus_clamav (antivirus_clamav\privacy\provider) ==
  Claims not to store any data with reason:
    'The ClamAV antivirus plugin does not store any personal data.'
== availability_completion (availability_completion\privacy\provider) ==
  Claims not to store any data with reason:
    'The Restriction by activity completion plugin does not store any personal data.'
== availability_date (availability_date\privacy\provider) ==
  Claims not to store any data with reason:
    'The Restriction by date plugin does not store any personal data.'
== availability_grade (availability_grade\privacy\provider) ==
  Claims not to store any data with reason:
    'The Restriction by grades plugin does not store any personal data.'
== availability_group (availability_group\privacy\provider) ==
  Claims not to store any data with reason:
    'The Restriction by group plugin does not store any personal data.'
```

More Tools

Test your code online <https://fiddles.io/#>

JSFiddle

SQLFiddle

Chrome Dev Tools

<https://developers.google.com/web/tools/chrome-devtools/>

Test APIs and WS with Postman

<https://www.getpostman.com/>

Catch mails with MailCatcher

<https://mailcatcher.me/>

GIT BISECT

Use binary search to find the commit that introduced a bug

<https://git-scm.com/docs/git-bisect>

Start the search

```
$ git bisect start
```

```
$ git bisect good ea13c6454a45988e88e91e9a41ab5fcd1d5e1be8
```

```
$ git bisect bad dbee1d569009217dd89fc4909893f93d5f5e9a43
```

```
Bisecting: 2 revisions left to test after this (roughly 1 step)
```

```
[38619503118cf17a4c2aa4bf4b659e9dec4d48f6] Make the MootlEUK amazing.
```

Now, test the code, then you explain to git the result:

git bisect bad or git bisect good depending on the success. And repeat until you find the bad commit. At last, run git bisect reset to get back to the HEAD commit.

```
$ git bisect reset
```

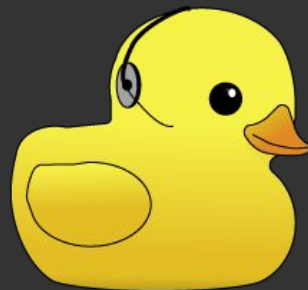


Thank
You

Extra Bonus

Rubber Duck Debugging

<https://rubberduckdebugging.com>



1. Beg, borrow, steal, buy, fabricate or otherwise obtain a rubber duck (bathtub variety)
2. Place rubber duck on desk and inform it you are just going to go over some code with it, if that's all right.
3. Explain to the duck what your code is supposed to do, and then go into detail and explain your code line by line.
4. At some point you will tell the duck what you are doing next and then realise that that is not in fact what you are actually doing. The duck will sit there serenely, happy in the knowledge that it has helped you on your way.



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