

GDB & Análise de bugs

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MySQL Brazil Virtual Meetup 2nd Edition

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Sobre Mim

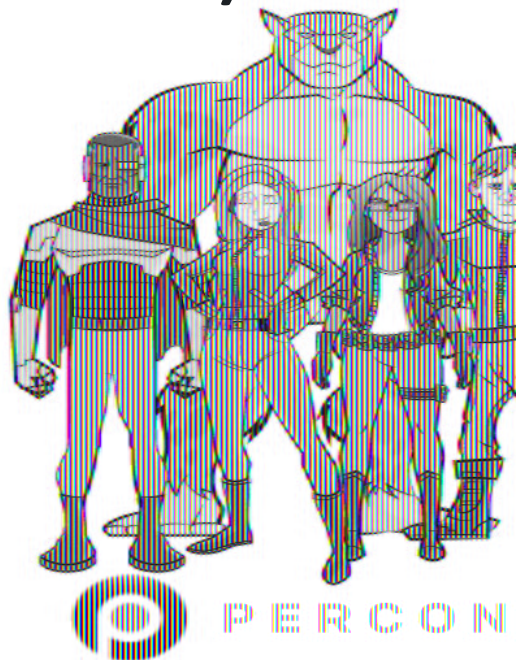
Marcelo Altmann

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 - *Engenheiro de Suporte Senior @ percona*
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- Tecnólogo em Sistemas para Internet
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- Certificações
 - *OCP, MySQL 5.7 Database Administrator*
 - *OCP, MySQL 5.6 Database Administrator*
 - *OCP, MySQL 5.6 Developer*
 - *OCP, MySQL 5 Database Administrator*
 - *OCP, MySQL 5 Developer*
 - *OCP, MySQL 5.0/5.1/5.5*

We are hiring!

- Database Engineer Remote (South America)

<https://jobs.lever.co/percona?lever-via=ppuf96MTKk>



MySQL está crashando ?!?!?!?

Sessões do erro

```
15:45:03 UTC - mysqld got signal 11 ;
Most likely, you have hit a bug, but this error can also be caused by malfunctioning hardware.
Thread pointer: 0x7f6db001c3d0
Attempting backtrace. You can use the following information to find out
where mysqld died. If you see no messages after this, something went
terribly wrong...
stack_bottom = 7f6e0c0654b8 thread_stack 0x46000
/usr/sbin/mysqld(my_print_stacktrace(unsigned char const*, unsigned long)+0x3d) [0x200b90d]
/usr/sbin/mysqld(handle_fatal_signal+0x333) [0x11cf0f3]
/lib64/libpthread.so.0(+0xf5f0) [0x7f6e24eed5f0]
/usr/sbin/mysqld(mysql_compress_context_init(mysql_compress_context*, enum_compression_algorithm, unsigned int)+0) [0x20036d0]
/usr/sbin/mysqld() [0x11b17d5]
/usr/sbin/mysqld(mysql_real_connect+0x99) [0x11b50b9]
/usr/sbin/mysqld() [0x11b6bd9]
/usr/sbin/mysqld() [0x1c98d0b]
/usr/sbin/mysqld() [0x1c99a15]
/usr/sbin/mysqld(handle_slave_io+0xbd1) [0x1ca4491]
/usr/sbin/mysqld() [0x24e57dc]
/lib64/libpthread.so.0(+0x7e65) [0x7f6e24ee5e65]
/lib64/libc.so.6(clone+0x6d) [0x7f6e2306b88d]

Trying to get some variables.
Some pointers may be invalid and cause the dump to abort.
Query (0): Connection ID (thread ID): 14
Status: NOT_KILLED
```


Sessões do erro

15:45:03 UTC - mysqld got signal 11 ;
Most likely, you have hit a bug, but this error can also be caused by malfunctioning hardware.

1

Thread pointer: 0x7f6db001c5a0

Attempting backtrace. You can use the following information to find out where mysqld died. If you see no messages after this, something went terribly wrong...

stack bottom = 7f6e0c0654b8 thread stack 0x46000

```
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```

2

Trying to get some variables.

Some pointers may be invalid and cause the dump to abort.

Query (0): Connection ID (thread ID): 14

Status: NOT_KILLED

3

Signals

- Definido em signals.h (linux)

```
/* ISO C99 signals. */
#define SIGINT      2      /* Interactive attention signal. */
#define SIGILL      4      /* Illegal instruction. */
#define SIGABRT     6      /* Abnormal termination. */
#define SIGFPE      8      /* Erroneous arithmetic operation. */
#define SIGSEGV     11     /* Invalid access to storage. */
#define SIGTERM     15     /* Termination request. */
```


Signals

- **SIGABRT / 6 - Assertion declaradas no código.**
 - `ut_a(expressão) / ut_ad(condição)` - Deve dar falso.
 - Utilizado para prevenir que erros se propaguem.
- **SIGSEGV / 11 - Segmentation Fault**
 - Proteção contra acesso inválido de memória.
 - Objeto deletado.
 - Área de memória externo ao programa.

Stack traces

- Finger print da execução até o momento do crash.
- Se Lê de baixo para cima / Bottom top
- Comum entre todas stack traces:
 - *handle_fatal_signal()* - Responsável por tratar os sinais que abortam o server - https://github.com/percona/percona-server/blob/8.0/sql/signal_handler.cc
 - *my_print_stacktrace()* - Responsável por logar a execução do MySQL que falhou. Pode ser desabilitado via `--skip-stack-trace`

Stack traces

```
/usr/sbin/mysqld(my_print_stacktrace(unsigned char const*, unsigned long)+0x3d) [0x200b90d]  
/usr/sbin/mysqld(handle_fatal_signal+0x333) [0x11cf0f3]  
/lib64/libpthread.so.0(+0xf5f0) [0x7f6e24eed5f0]  
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```

Symbols

- Lista de funções do código fonte
- ID em hexadecimal
- Aumenta o tamanho do binário.

```
[root@marcelo--replication-2 ~]# file /usr/sbin/mysqld
/usr/sbin/mysqld: ELF 64-bit LSB executable, x86-64, version 1 (SYSV), dynamically linked (uses shared
red libs), for GNU/Linux 2.6.32, BuildID[sha1]=66143971fe5a27dc619003863fc32dbb08092f8f, stripped
```

- Instalar o pacote -debuginfo

Symbols

- `nm -Dn /usr/sbin/mysqld > /tmp/symbols.out`
- Extrair a assinatura em hexadecimal do stack trace:
`cat /tmp/stack.tmp | awk -F'[' '{print $2}' | awk -F ']' '{print $1}' > /tmp/stack.out`

```
[root@marcelo--replication-2 sbin]# head -4 /tmp/stack.out
0x200b90d
0x11cf0f3
0x7f589f2105f0
0x20036d0
```

Symbols

```
marcelo@marce-bld:/work/ps/ins/5.7/bin$ ./resolve_stack_dump /tmp/symbols.out /tmp/stack.out | c++filt
Warning: resolve_stack_dump is deprecated and will be removed in a future version.
0x200b90d my_print_stacktrace(unsigned char const*, unsigned long) + 61
0x11cf0f3 handle_fatal_signal + 819
0x7f589f2105f0 _end + -1690096048
0x20036d0 mysql_compress_context_init(mysql_compress_context*, enum_compression_algorithm, unsigned int) + 0
0x11b17d5 mysql_init + 1061
0x11b50b9 mysql_real_connect + 153
0x11b6bd9 mysql_set_character_set + 873
0x1c98d0b sql_slave_killed(THD*, Relay_log_info*) + 8075
0x1c99a15 sql_slave_killed(THD*, Relay_log_info*) + 11413
0x1ca4491 handle_slave_io + 3025
0x24e57dc pfs_new_thread_vc(unsigned int, void const*, unsigned long long) + 428
0x7f589f208e65 _end + -1690126651
0x7f589d38e88d _end + -1722085139
```


GDB

- GNU Debugger
- Funciona em várias linguagens
- With Great Power, comes great responsibility
- Pode ser usado:
 - *Remoto*
 - *Interpretando processo - `gdb -p PID`*
 - *Rodando processo - `gdb --args bin/mysqld [argumentos] --gdb`*
 - *Offline (coredump) - `gdb bin/mysqld core.PID`*

GDB

- Break point - parar neste ponto quando a execução chegar.
- Next - rodar o código até a próxima linha.
- Continue - rodar o código até próximo break point.
- Step - entrar na função.
- Bt - Mostrar Backtrace / Stack trace.
- Frame - pular para frame específico dentro da backtrace.

Poor Man's Profiler - PMP

- Agregador de stack traces.
- Útil para server com muitas threads
- <https://poormansprofiler.org/>
- Parte do Percona Toolkit - pt-pmp

cscope

- Browser para código fonte
- Mais otimizado que `grep -Ri [texto] =)`
- <https://www.percona.com/blog/2017/09/12/cscope-searching-code-efficiently/>
- https://github.com/altmannmarcelo/my_scripts/blob/master/bin/mycscope
 - *InnoDB usa .ic*
 - *Mensagens de erro são declaradas em .txt (errmsg-utf8.txt, messages_to_clients.txt, messages_to_error_log.txt)*

Mutex

- Proteção contra acesso simultâneo a hot area.

- Vou ler / escrever em variável X

```
mutex_lock(var_mutex);
```

```
var = 'bla';
```

```
mutex_unlock(var_mutex);
```

Link para gravação

<https://www.youtube.com/watch?v=WkdWkcDz2Kk>

DEMO TIME!!!

Fails in 99.9% of the cases!

Obrigado!



Database Performance Matters