
# Testing PostgreSQL with Fault Injection

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# The Challenge

```
$ ldd /usr/lib/postgresql/8.3/bin/postgres
     linux-gate.so.1 =>  (0xb7c6a000)
     libxml2.so.2 => /usr/lib/libxml2.so.2 (0xb7b05000)
     libpam.so.0 => /lib/libpam.so.0 (0xb7af9000)
     libssl.so.0.9.8 => /usr/lib/i686/cmov/libssl.so.0.9.8 (0xb7ab2000)
     libcrypto.so.0.9.8 => /usr/lib/i686/cmov/libcrypto.so.0.9.8 (0xb7967000)
     libkrb5.so.3 => /usr/lib/libkrb5.so.3 (0xb78d5000)
     libcom_err.so.2 => /lib/libcom_err.so.2 (0xb78d1000)
     libgssapi_krb5.so.2 => /usr/lib/libgssapi_krb5.so.2 (0xb78a7000)
     libcrypt.so.1 => /lib/tls/i686/cmov/libcrypt.so.1 (0xb7874000)
     libdl.so.2 => /lib/tls/i686/cmov/libdl.so.2 (0xb7870000)
     libm.so.6 => /lib/tls/i686/cmov/libm.so.6 (0xb784a000)
     libldap_r-2.4.so.2 => /usr/lib/libldap_r-2.4.so.2 (0xb7808000)
     libc.so.6 => /lib/tls/i686/cmov/libc.so.6 (0xb76aa000)
     libz.so.1 => /usr/lib/libz.so.1 (0xb7694000)
     libk5crypto.so.3 => /usr/lib/libk5crypto.so.3 (0xb766f000)
     libkrb5support.so.0 => /usr/lib/libkrb5support.so.0 (0xb7666000)
     libkeyutils.so.1 => /lib/libkeyutils.so.1 (0xb7662000)
     libresolv.so.2 => /lib/tls/i686/cmov/libresolv.so.2 (0xb764e000)
     libpthread.so.0 => /lib/tls/i686/cmov/libpthread.so.0 (0xb7635000)
     liblber-2.4.so.2 => /usr/lib/liblber-2.4.so.2 (0xb7626000)
     libsasl2.so.2 => /usr/lib/libsasl2.so.2 (0xb760e000)
     libgnutls.so.26 => /usr/lib/libgnutls.so.26 (0xb7571000)
     libtasn1.so.3 => /usr/lib/libtasn1.so.3 (0xb755f000)
     libgcrypt.so.11 => /lib/libgcrypt.so.11 (0xb74f6000)
     libgpg-error.so.0 => /lib/libgpg-error.so.0 (0xb74f1000)
$ ldd /usr/lib/libgnutls.so.26
     linux-gate.so.1 =>  (0xb7ffa000)
     libtasn1.so.3 => /usr/lib/libtasn1.so.3 (0xb7f3c000)
     libz.so.1 => /usr/lib/libz.so.1 (0xb7f26000)
     libgcrypt.so.11 => /lib/libgcrypt.so.11 (0xb7ebc000)
     ...
```

# The Problem

Documentation / man pages are incomplete

- *modify_ldt* claims returns only EFAULT, EINVAL, and ENOSYS
  - on Ubuntu, it can also return ENOMEM !!
- *htmlParseDocument* (libxml2) claims to only return 0 or -1
  - on Ubuntu, it can also return 1 in some failure cases !!

Porting PostgreSQL to other platforms ...

- NetBSD : *close() claims to only return errno codes EBADF or EINTR*
- Solaris: ENOLINK is also possible !!
- FreeBSD: ECONNRESET is also possible !!
- Linux: EIO is also possible !!
- HP/UX: ENOSPC is also possible !!

Nobody is perfect (even Postgres hackers)

**Do you trust PostgreSQL's error recovery code ?**

# The Tool

LFI = Library-level Fault Injector

- http://lfi.sourceforge.net/
- Tool came out of research lab at EPFL (Swiss Federal Inst. of Tech.)

Test programs by injecting faults at the library interface level

- out-of-memory, conn errors, interrupted syscalls, bad hw...

Based on fault injection scenarios (described in XML files)
LFI profiler can automatically...

- use static analysis of library binaries to discover all errors that could be encountered
- generates injection scenarios

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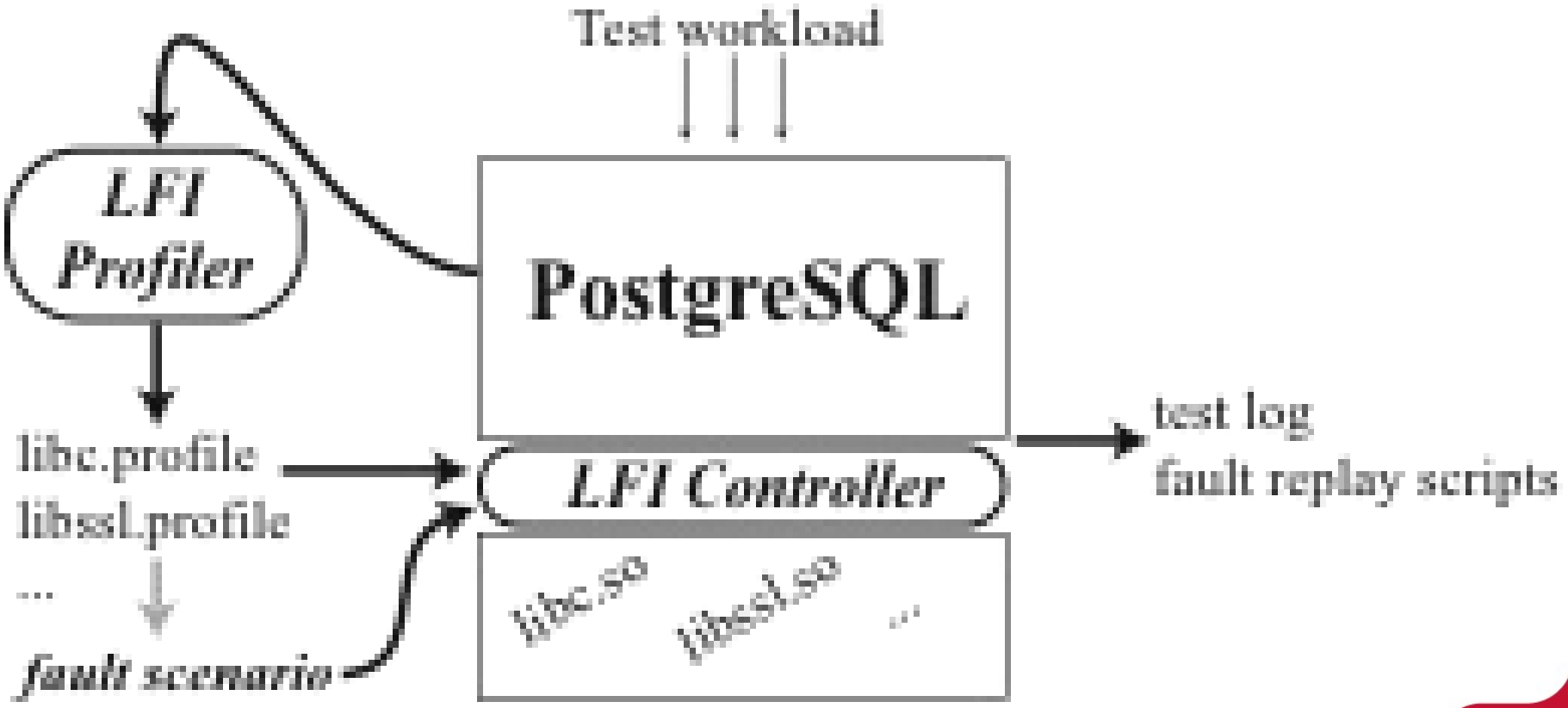
# Architecture

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# Appeal for Input

Which parts of PostgreSQL are most crucial ?

- commit code? buffer management? ...

"Interesting" fault scenarios to start with?

We are looking for interested developers

- Help make LFI a solid tool
- Help solidify PostgreSQL through FI testing

**http://lfi.sourceforge.net/**

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