The art of sandboxing
Reducing Complex Systems to Manageable Boxes

Giuseppe Maxia, QA Director, Continuent, Inc

Facts. And Demos. Possibly fun
about me - Giuseppe Maxia

• a.k.a. The Data Charmer
• QA Director at Continuent, Inc
• Long time hacking with MySQL features
• Formerly, community manager, db consultant, designer, coder.
• A passion for QA and open source
• Blogger

• http://datacharmer.blogspot.com
What is this all about

• Sandboxes vs. VMs
• MySQL Sandbox: a toolkit for laziness
• Genesis of a sandbox
  • Understand the system
  • Find the boundaries
  • Tame the system
• Make it usable
• Make it extendable
• Tricks of the trade
AGENDA

Sandboxes and VMs

Friday, April 15, 2011
public Sandbox definition

- A sandbox is a testing environment that isolates untested code changes and outright experimentation from the production environment or repository.
- Sandbox is a security mechanism for separating running programs. It is often used to execute untested code, or untrusted programs from unverified third-parties, suppliers and untrusted users.

(from Wikipedia)
my Sandbox definition

• Sandbox is a testing environment that:
  • isolates a given running program
  • avoids conflicts with similar programs
  • makes the program easy to install and use
Why not a VM?

- VMs are great.
- But expensive. They use RAM and storage.
- You can use a dozen sandboxes in your laptop. Not VMs.
Again, what’s a sandbox?

• Installation tamer:
  • Take a program, which is designed to run in a separate host
  • Make it behave, so it runs with more of its kind in the same host

• Usage simplifier:
  • provide shortcuts to make that program easy to use
A popular example

MySQL Sandbox, A toolkit for productive laziness
Laziness

Laziness is a disinclination to activity or exertion despite having the ability to do so.

http://en.wikipedia.org/wiki/Laziness
I am an experienced DBA

- I have the ability of installing multiple MySQL servers.
- In the same host.
- Without conflicting.
- Manually.
- Do I feel inclined to do so?
- Several times a day?
- I DON'T THINK SO.
I am a command line wizard

- After installing multiple servers
- I can use them
- with various long options.
- Manually.
- Do I feel inclined to do so?
- Many dozen times a day?
- I DEFINITELY DON'T THINK SO.
I can set up replication

- Almost without errors.
- And then I can connect to masters and slaves with long options on the command line.
- Do I feel inclined to do so?
- I DON'T THINK SO.
I can set up circular replication

- Almost always with errors.
- And cursing.
- Do I feel inclined to do so?
- I DON'T THINK SO.
I can install plugins

- After reading the manual.
- And translating from intentions to reality.
- And copying-and-pasting.
- Do I feel inclined to do so?
- I DON'T THINK SO.
I have the ability

• but I don't feel inclined to do repetitive work

• I ADMIT IT: I AM LAZY
YES: I AM A LAZY DEVELOPER
A lazy developer ®

Someone who writes 12,000 lines of code to spare himself (*) the trouble of typing 15 lines on a terminal.

(*) And another 1,000,000 people
That's me
overview

MySQL server

DATA DIRECTORY

PORT

MySQL server

Data

DB1

DB2

DB3

Data

DB1

DB2

DB3

DATA DIRECTORY

PORT

Friday, April 15, 2011
overview

MySQL server

SAME DATA DIRECTORY?

/Data

/var/lib/mysql

MySQL server

DATA CORRUPTION

Friday, April 15, 2011
MySQL server

SAME PORT or SOCKET?

MySQL server

3306

/tmp/mysql.sock

/tmp/mysql.sock

DOES NOT START
The hard way (1)
the hard way (2)
The easy way

$ make_sandbox \ /path/to/mysql-5.1.54_linux.tar.gz

# it should work always
The easier way

$ make_sandbox 5.1.54

# Needs some preliminary work
The easiest way

$ sb 5.1.54

# Needs the same preliminary work
MySQL Sandbox

MySQL server

$SANDBOX_HOME/msb_VERSION/data

/tmp/mysql_VERSION.sock
Single Sandbox

MySQL server

customized scripts

start
stop
restart
status
clear
send_kill
use
Multiple Sandbox

MySQL server

customized scripts

```
start_all
stop_all
restart_all
status_all
clear_all
send_kill_all
use_all
```

m
s1
s2
n1
n2
n3

Friday, April 15, 2011
Where do you get it

- from CPAN
  
  ```
sudo cpan MySQL::Sandbox
  ```

- from launchpad
  
  `http://launchpad.net/mysql-sandbox`
The easy replication way

$ make_replication_sandbox \ 
 /path/to/mysql-5.1.54_linux.tar.gz

# or, after some preparation

$ make_replication_sandbox 5.1.54
default architecture

$HOME

/sandboxes

$SANDBOX_HOME

opt

mysql

$SANDBOX_BINARY

expanded tarballs

installed sandboxes
default architecture
A Sandbox, step by step
Step 1: make an installer
installer

• A program that knows the basics of how to install a complex application
• Hiding the details and the ugly output
• Returning clear success or error codes
step 1.1: make it work!

- make sure the installer works
- even if it is ugly
- even if it requires long commands
- you can refine it later
Step 2: design a framework

- define:
  - where you want to install
  - where you get the binaries from
  - how to shape the sandbox directories
step 3: define an interface

• put the installer inside an easy to use shell
• make the installer create scripts that help the user
• Ask yourself: would I use this stuff?
Techniques: ports (1)

- Easy:
  - the program has a --port option
  - tell the installer to use that option
Techniques: ports (2)

• Difficult:
• the program does not have a --port option
  • (a) the program has a configuration file:
    • make the installer modify that file
  • (b) no configuration file:
  • use a tunnel
Techniques: hostnames

- Make fake hostnames in /etc/hosts
techniques: conf files

- method 1: use a template
  - PRO: easy to parse
  - CON: stiff and hard to evolve

- method 2: parse and replace
  - PRO: resilient to changes
  - CON: difficult to parse
template example

repl_boot_script=_BOOT_SCRIPT_
repl_dataserver_host=_THIS_HOST_
repl_dbport=_REPL_PORT_
repl_logs_dir=_TUNGSTEN_BASE_/logs
repl_backup_storage_dir=_TUNGSTEN_BASE_/backups
techniques: hardcoded calls to programs

• if your program calls a given program
• change the $PATH
• put a fake program earlier in $PATH
• make that program do what you want
techniques: make it extensible

• A demo
demos
THANKS