# LAVA FOR BISECTING KERNEL BUGS

## LAVA MEETS GIT BISECT RUN

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# STARTING POINT

Someone broke the time, fix asap!

```
# cat test-rtc
date '+%F %T'
hwclock
# ./test-rtc
1970-01-01 00:00:51
hwclock: Cannot access the Hardware Clock via any known method.
hwclock: Use the --debug option to see the details of our search for an acces
```

# GIT BISECT TO RESCUE

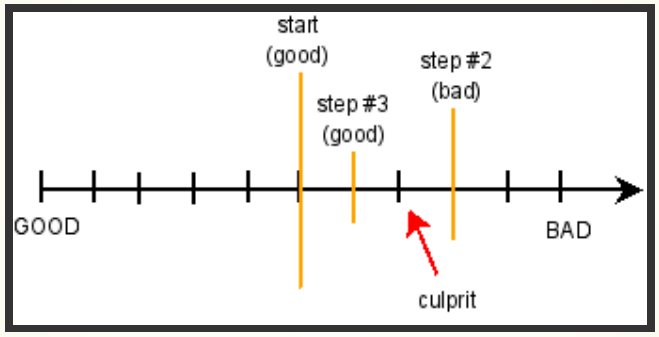
Start Git bisect by defining a range of commits to check

```
$ git bisect start <BAD> <GOOD>
Bisecting: 109 revisions left to test after this (roughly 7 steps)
[1570ebd3206c2f5e6ba7e42652312183cadb4511] s390/bpf: Fix offset parameter for
```

- <BAD> is first known broken commit/tag
- <GOOD> is last know working commit/tag
- The first commit to test has been checked out

# GIT BISECT MANUALLY

- Test the commit and tell git if it was good or bad
- `git bisect bad` for failed tests
- `git bisect good` for success
- Bisect algorithm finds the culprit commit in O(log n) steps



# GIT BISECT RUN

```
$ git bisect start badcommit goodcommit
$ git bisect run ./compile-and-test
running ./compile-and-test
```

Exit code of the compile-and-test script decides if a commit was good or bad.

# LETS START DEMO

Start bisecting in the background

```
$ cat ./bisect
make O=build omap2plus_defconfig > /dev/null
make O=build/ zImage dtbs > /dev/null||exit 125
lava-boot -k build -d beaglebone-black -r test-rtc --quiet

$ git bisect start HEAD v3.19-rc5
voipio@beaming:~/linaro/linux$ git bisect start HEAD v3.19-rc5
Bisecting: 109 revisions left to test after this (roughly 7 steps)
[c87fbcb6833c26d5e4fe261db4541ca1cedb3642] s390/bpf: Fix sk_load_byte_msh()
$ time git bisect run ./bisect
running ./bisect
```

Let the computer do the work and me do the talk - just in case: pre-recorded demo.

# LAVA

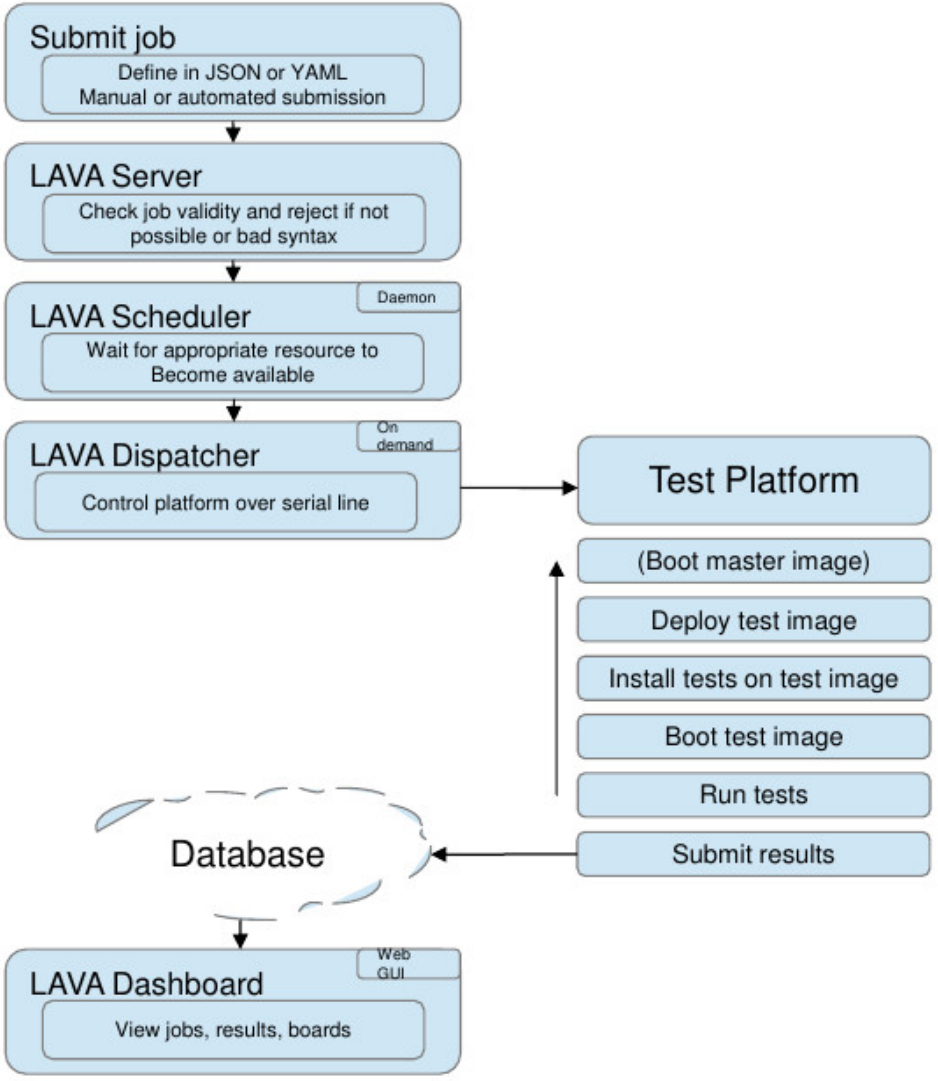
Linaro Automated Validation Architecture

- “Metal as a Service” for testing software on a range of devices
- Submit jobs for a device type and get results
- Requires _serial_ access, network and power control
- Command line and web interface
- Available in Debian: `apt-get install lava`

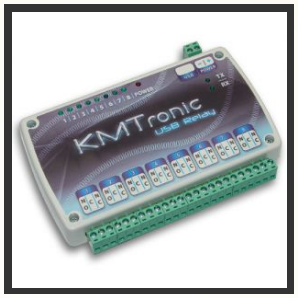
# LAVA DEMO ON THIS LAPTOP

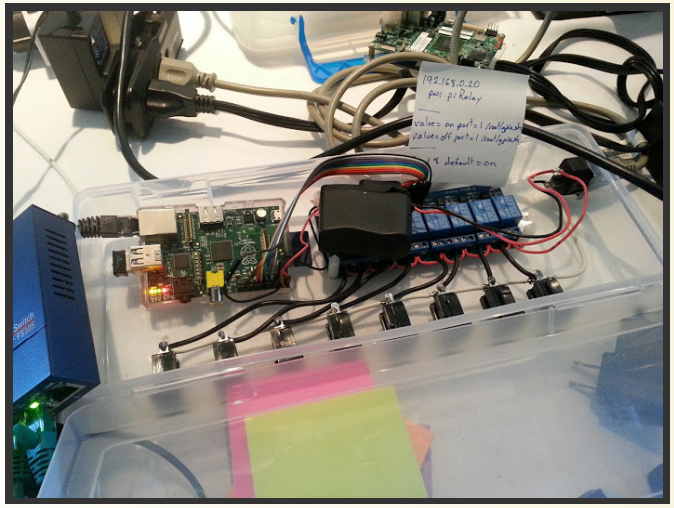
- lava-server installed inside KVM
- KVM and eth0 bridged for NFS/TFTP
- Power control with USB relay
- Web interface live at http://lava-server/

# LAVA


Submit job
Define in JSON or YAML
Manual or automated submission
LAVA Server
Check job validity and reject if not possible or bad syntax
LAVA Scheduler
Daemon
Wait for appropriate resource to Become available
LAVA Dispatcher
On demand
Control platform over serial line
Test Platform
(Boot master image)
Deploy test image
Install tests on test image
Boot test image
Run tests
Submit results
Database
LAVA Dashboard
Web GUI
View jobs, results, boards

# LAVA - POWER CONTROL



ebay "apc masterswitch" 100€+

Ubiquiti mpower 84€

Boxed relays 38€

DYI relays 10€

Future: tailored for LAVA, OpenTAC BeagleBone cape providing power, ethernet, serial and more.

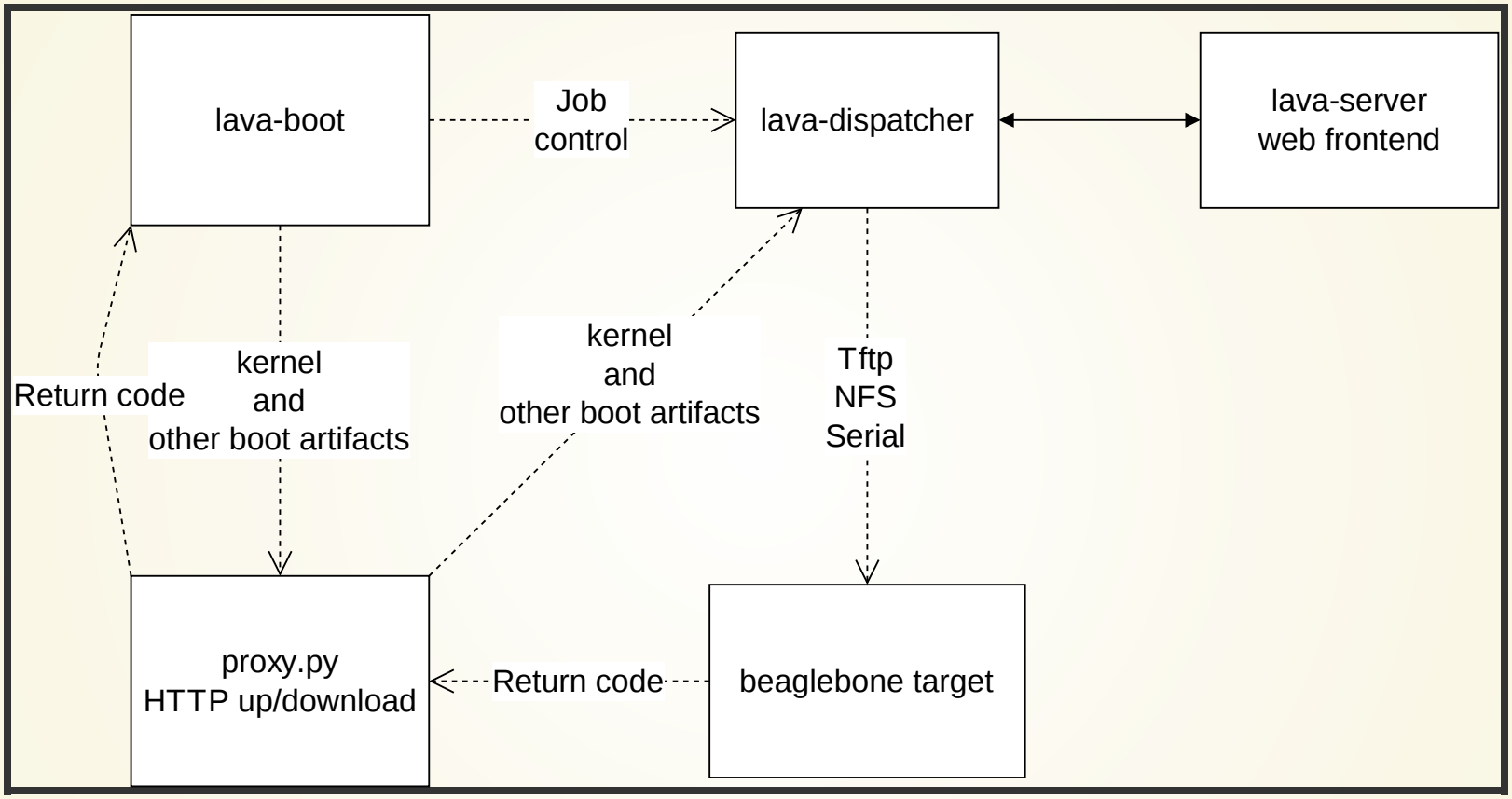
# LAVA-TOOL

- Official LAVA command line tool
- Uses xml-rpc to lava-server
- Asynchronous - doesn't wait for job to finish
- Reads authentication token from gnome-keyring :(
- = Not really suitable for bisecting

# LAVA-BOOT

- Complements lava-tool
- Synchronous - waits for job to finish and gives exit code
- Starts a small HTTP server for LAVA to fetch kernel, dtb etc
- Variable substitution and other lifesaving features
- Stores authentication token in config file

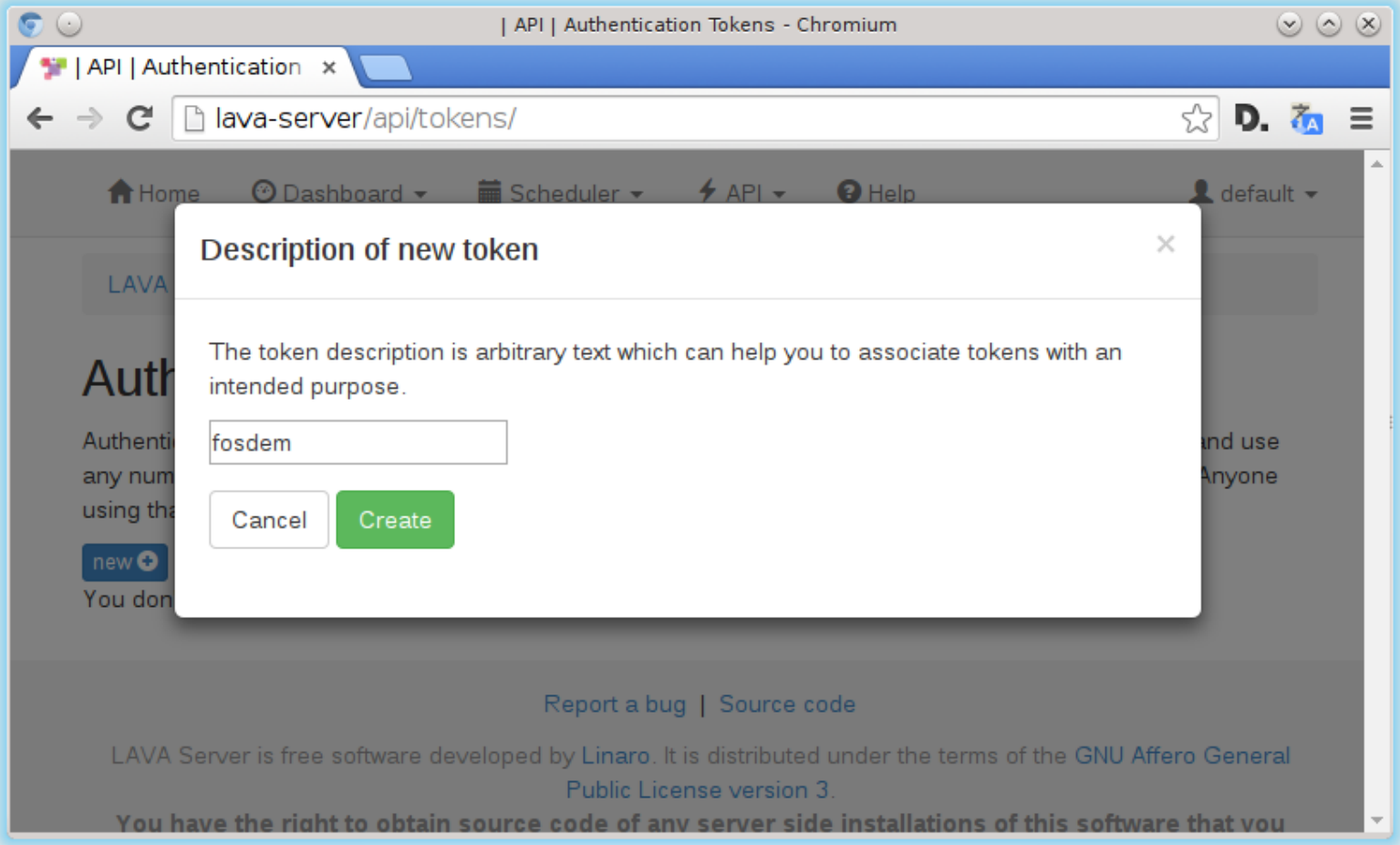
# LAVA-BOOT GRAPH

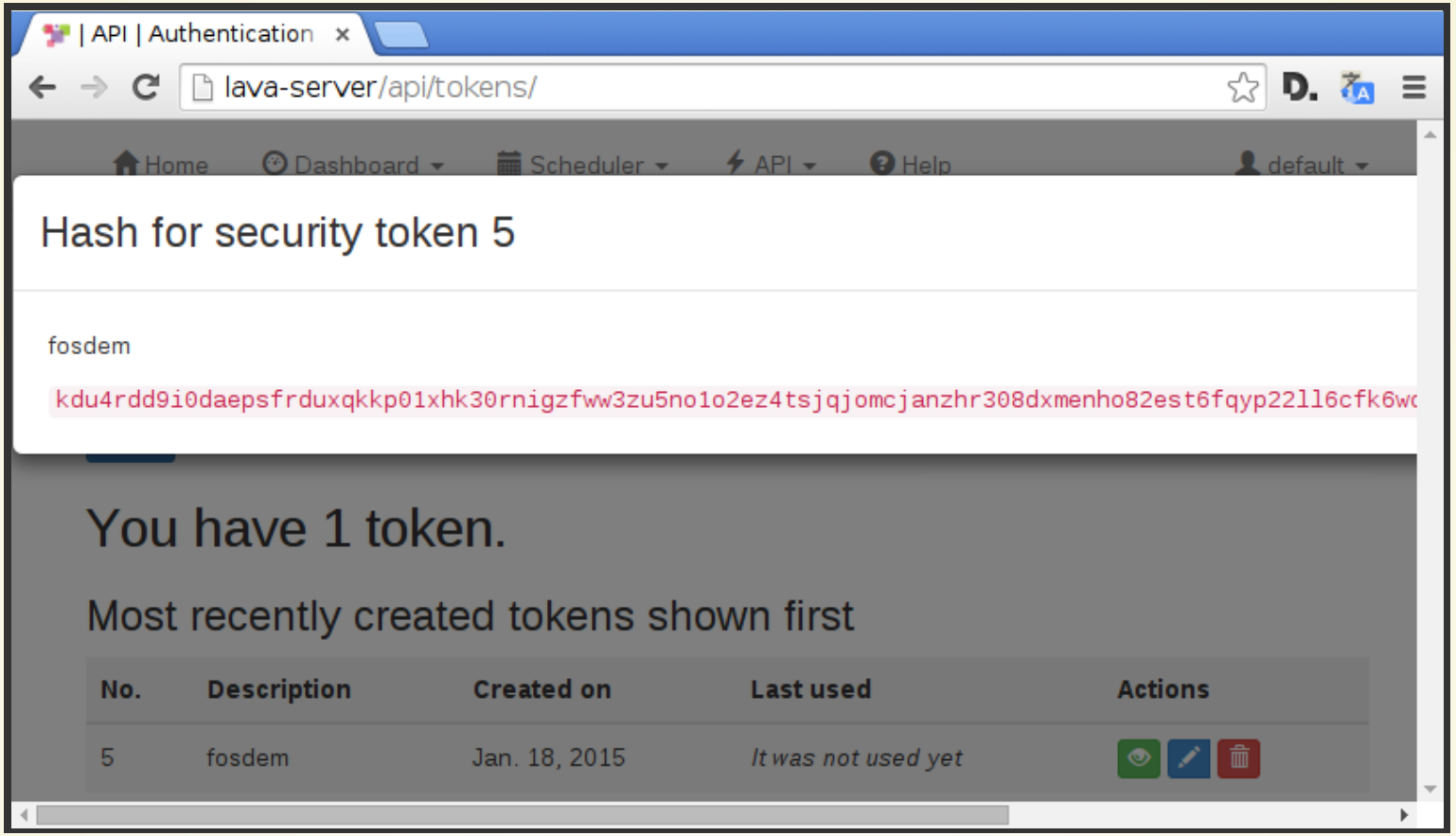


# LAVA AUTHENTICATION

To script LAVA, authentication token is needed.

Select API -> Authentication tokens


| API | Authentication Tokens - Chromium
| API | Authentication
lava-server/api/tokens/
Home
Dashboard
Scheduler
API
Help
default
Description of new token
The token description is arbitrary text which can help you to associate tokens with an intended purpose.
fosdem
Cancel
Create
new
Report a bug | Source code
LAVA Server is free software developed by Linaro. It is distributed under the terms of the GNU Affero General Public License version 3.


| API | Authentication
lava-server/api/tokens/
Home
Dashboard
Scheduler
API
Help
default
Hash for security token 5
fosdem
kdu4rdd9i0daepsfrduxqkkp01xhk30rnigzfww3zu5no1o2ez4tsjqjomcjanzhr308dxmenho82est6fqyp22ll6cfk6wc
You have 1 token.
Most recently created tokens shown first
No.
Description
Created on
Last used
Actions
5
fosdem
Jan. 18, 2015
It was not used yet

# LAVA-BOOT SETTINGS

Settings stored in ~/lava.yaml

```
server: lava-server
user: default
token: kdu4rdd9i0daepsf...
proxy-hostname: 192.168.2.10
https: false
```

# LAVA JOB DEFINITION

```
actions:
    - command: deploy_linaro_kernel
      parameters:
          dtb: '${PROXY}/${DTB}'
          kernel: '${PROXY}/${KERNEL}'
          nfsrootfs: '${ROOTFS}'
          target_type: ubuntu
    - command: boot_linaro_image
    - command: lava_test_shell
      parameters:
        testdef_urls:
            - '${PROXY}/${TESTCASE}'
        timeout: 600
device_type: ${DEVICE_TYPE}
```

Converted from YAML to JSON when submitting to LAVA

# VARIABLE SUBSTITION

```
actions:
    - command: deploy_linaro_kernel
      parameters:
          dtb: 'http://192.168.2.10/am335x-boneblack.dtb'
          kernel: 'http://192.168.2.10/zImage'
          nfsrootfs: 'file:/home/voipio/debian-minimal.tgz'
          target_type: ubuntu
    - command: boot_linaro_image
    - command: lava_test_shell
      parameters:
        testdef_urls:
            - 'http://192.168.2.10/test_definition.yaml'
        timeout: 600
device_type: beablebone-black
```

test-rtc script was automatically embedded in test_definition.yaml which is a lava_test_shell definition

# BISECT CAVEATS

- Git tree needs to work in general for every commit
- -> Consider using lava-boot with git-test-sequence to verify all commits
- Complex merges and commits that touch unrelated files make bisecting hard
- -> Do self-contained commits and clean short-lived topic branches
- Bisecting randomly reproducible bugs gives wrong results!

# REFERENCES

- Git Bisect Manual
- Enjoy Fighting Regressions with git bisect
- LAVA wiki
- LAVA documentation
- lava-boot docs
- Linaro mainline linux testing Kernelci.org
- Slides created using reveal.js
- Shell session recorded with TermRecord

These slides at http://people.linaro.org/~riku.voipio/lava-bisect/

# EXPORT TO PDF

Presentations can be exported to PDF, below is an example that's been uploaded to SlideShare.