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
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 known 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
Exit code of the compile-and-test script decides if a commit was good or bad.
LET'S 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)
[c87fbc6833c26d5e4fe261db4541ca1cedb3642] 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 - 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-boot
- proxy.py (HTTP up/download)
- kernel and other boot artifacts
- beaglebone target
- Job control
- Tftp, NFS, Serial
- Return code

lava-dispatcher

lava-server web frontend
LAVA AUTHENTICATION

To script LAVA, authentication token is needed.
Select API -> Authentication tokens
Description of new token

The token description is arbitrary text which can help you to associate tokens with an intended purpose.

- fosdem

- Cancel
  - Create
Hash for security token 5

Password: fosdem
Hash: kdu4rdd9i0daepsfrduxqkkp01xhk30rnigzfww3zu5no1o2ez4tsjqjomcjanzhr308dxmenho82est6fqyp221l6cfk6wc

You have 1 token.

Most recently created tokens shown first

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Created on</th>
<th>Last used</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>fosdem</td>
<td>Jan. 18, 2015</td>
<td><em>It was not used yet</em></td>
<td></td>
</tr>
</tbody>
</table>
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

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