Developer Tools and Methods
Tips and Tricks BOF

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Agenda

• Discuss methods and tools that I use in embedded
• Anyone can present their tips or tricks
  • Should be an open discussion
Outline

• Git tips
• Patch management
• Source searching
• Kernel debugging
• Testing
• Board handling
• Personal productivity
• Your ideas....
Git tips – finding info about commits

• Show when a commit was entered into the tree
  • Show when a commit was entered in the tree: "git describe <commit>"
  • Show the version of software where a change first appeared: "git describe --contains <commit>"

• `git log <file-or-dir>`
  • Narrow the scope of the log

• `git show <commit-id>`
  • Get details, including patch, for commit
Git tips - aliases

• how to do a git alias, with colors!
  • 'git config --global alias.lg "log --pretty=format:"
    "%Cred%h%Creset-%C(yellow)%d%Creset
    %s %Cgreen(%cr %an)%Creset" --abbrev-commit --
date=relative"
  • git lg [<dir_or_file>]

2ab3f29 - Merge branch 'akpm' (Andrew's fixes) (11 days ago Linus Torvalds)
2008713 - Makefile: Documentation for external tool should be correct (11 days ago H. Peter Anvin)
f230250 - pidns: limit the nesting depth of pid namespaces (11 days ago Andrew Vagin)
cbb525b - Merge branch 'for-3.7-fixes' of git://git.kernel.org/pub/scm/linux/kernel/git/tj/cgroup (12 days ago Linus Torvalds)
d579a35 - Merge branch 'for-3.7-fixes' of git://git.kernel.org/pub/scm/linux/kernel/git/tj/wq (12 days ago Linus Torvalds)
c0158ca - workqueue: cancel_delayed_work() should return %false if work item is idle (12 days ago Dan Magenheimer)
More git tips

- Find the commit for a specific line in a file:
  - "git annotate <file> | grep <regex_of_line>"
  - Then do: "git show <commit_of_interest>"
  - This is good to find out: why is it here? who did this?, when did it get changed to this?

- Find the commit that caused a problem
  - git bisect

- How to poke through your firewall
  - How to set up a git proxy
Git rebase

• Several people said: "git rebase -i" is very handy
  • Can be used as a replacement for quilt
  • 'git add –p' – interactive add hunks to next commit
  • 'git commit –amend' – adjust the last commit
Git disaster recovery

- git reset
- git reflog
  - There's a whole parallel world of git action history - separate from the commit history
  - Can find stuff you committed but "lost"
Patch management

• quilt - patches as first class objects
  • git for development work, then convert to quilt patches
  • git rebase –interactive

• Precommit
  • quilt pop –a ; basediff ; quilt push –a ; scripts/fix-filemodes.sh

• Patch splitting and combining:
  • diffinfo - my own tool for managing patches
  • splitpatch - tool to break patches apart
Source searching – find-related

• cgrep, mgrep, confgrep, kgrep, armcgrep, jgrep

  • scan C code, Makefiles, .config, Kconfig, arm C files, and java code, respectively for a search pattern

  • thin wrappers on 'find . [some conditions] | xargs grep $1'

• git grep <search-expr>

  • Ignores generated files (files not under git management) you may have in your tree
Searching - finds

• finds - find a string in a set of files (Credit to Todd Fischer of RidgeRun)
  • I use a tool, finds, I got from someone about 15 years ago. It simply does a recursive look for a string in all files of interest in a directory tree. I have created a variety of variations of finds (which I usually later throw away) as my search needs change.
  • Basically: 'find . <some-conditions> -exec fgrep -H "$1" {} \
  • Has lots and lots of other qualifiers. See:
    • https://www.ridgerun.com/developer/wiki/index.php/Tip_of_the_day#finds__find_a_string_in_common_text_files
Kernel debugging

- Use of fs/sync.c:SYSCALL_DEFINE0(sync)
  - For user-space triggered printks
- Use of qemu for kernel debugging
- Don't forget CONFIG_DEBUG_LL and CONFIG_EARLY_PRINTK (on ARM)
- Ability to reset board and dump memory
  - Finding the printk buffer with U-boot
Testing

- tbtorture.sh - for stress testing
Board handling

• Handling lots of board/switching between boards
  • Consistent board setup (including remote access)
  • Connections: serial, network, power (maybe USB)
    • Digital Power Logger

• Usually use tftp boot kernel, with NFS rootfs
  • But can do other setups: feed kernel through serial line, put kernel on SD card using known-good kernel, etc.
Tiny Target Control (ttc)

- ttc - command line tool for board control
  - Abstracts differences between boards
  - Allows for board sharing (ttc reserve)
  - Everything is scriptable, and remote-able
  - Object-oriented: inheritance to quickly modify attributes of a board "class"

- Items abstracted:
  - Obtaining kernel source, toolchain, architecture, defconfig, kernel image name, tool paths
  - Kernel build and install
  - Board console access, reboot, run arbitrary commands, reset
  - Filesystem access (copy from/to)
Finding the ttyUSB for a board

• Finding the ttyUSB* for a board (Credit to Todd Fischer of RidgeRun):

  • /dev/ttyUSB sometimes changes association on host reboot. Todd created two scripts lsuart and uart. lsuart gives me information about USB uarts

```
Available USB UARTs
-------------------
a:/dev/ttyUSB0 FTDI USB Serial Device 0000:00:04.1-4.1 (4 port jack A)
b:/dev/ttyUSB1 FTDI USB Serial Device 0000:00:04.1-4.2 (4 port jack B)
c:/dev/ttyUSB2 FTDI USB Serial Device 0000:00:04.1-4.3 (4 port jack C)
d:/dev/ttyUSB3 pl2303 0000:00:02.1-4.2 () 

In use
------
/dev/ttyUSB4: 9705: picocom -b 115200 -r -l /dev/ttyUSB4
```
Assigning console names

• Give names (a, b, c, d) to the 4 fixed uarts
  • Now I look at which port my serial cable is plugged into - say the 3rd one, which I call c, and I can fire up picocom with the standard setting using
    • uart c

• Use the PID from the 'In use' section of the lsuart output to kill terminal sessions

• lsuart is around 200 lines of ugly sysfs parsing
More serial port stuff

- ser2net (Credit to Jean-Christophe PLAGNIOL-VILLARD)
  - Converts from serial port to network interface
Loading the kernel from host

• ptxdist and barebox (Credit to Robert Schwebel)
  • Can load kernel via nfs server
  • Does not require root privileges on host
Copying images over the serial line

• How to copy data over serial line to Linux: (credit to Alan Carvalho de Assis)
  • http://acassis.wordpress.com/2012/10/21/how-to-transfer-files-to-a-linux-embedded-system-over-serial/
Personal productivity

- my workflow:
  - different day for each topic area
  - 'today' script
- multiple todo's, NOTES all over the place (several in each work directory)
- must do a context save in each directory, before moving on
- git branch is essential - commit changes (even if flaky) before moving on
Mailing lists

• My favorite mailing lists:
  • sorry, but linux-embedded seems to be dead
  • lkml, linux-arm, yocto-devel
  • celinux-dev
Events

• Attend conferences, talk to smart people
  • I used to get worried about missing sessions
    • The "hallway track" can be as important as the sessions

• Conferences I attend:
  • ELC, ELCE, linuxcon US, Linuxcon Japan, Linuxcon Europe
    (by serendipity)
  • What about plumbers?? other regional events??
    • Linaro now streams lots of stuff
    • I regularly attend CE Workgroup Japan Jamboree by skype
Your ideas….

• [Have discussion here 😊]
• Some things that came up:
• Git commands:
More git stuff

• **Git show** `<commit-id>:\<file>`
  • Show the file at the time of that commit

• **Mark and merge commits in a series**
  • **Git commit** –fixups `<commit-id>` (repeated as needed for different commits)
  • **Git rebase** –i –autosquash

• **Git reflog** | **cut** –b -8 | **gitk**
  • Show items from reflog in a graphical user interface
Searching and scanning

- Opengrok
- Lxr
- Android x-ref
- Cscope
Debugging

• Can use /proc/kmem image as a kernel core dump:
  • Cat /proc/kmem >corefile
  • Gdb vmlinux corefile

• Ramconsole is good

• Debugging with leds – it's possible even with one led

• Jtag is very nice
  • Can load the kernel into memory with jtag
Testing

- Lmbench is popular
Miscellaneous

• Screen is nice
  • You can save a session and resume it from somewhere else