

# Developer Tools and Methods Tips and Tricks BOF

Tim Bird  
Sony Network Entertainment

# 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`,  
`jpgrep`
  - 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](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 printk
- 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)  
:/dev/ttyUSB3 pl2303 0000:00:02.1-4.2 ()  
d:/dev/ttyUSB4 FTDI USB Serial Device 0000:00:04.1-4.4 (4 port jack D)
```

## 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