Linux-tiny revival

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Linux-tiny revival

- Introduction to Linux-tiny project

- History

- Status

- Recent work

Intro to Linux-tiny

- ## What is Linux-tiny?

  - A collection of patches to reduce the memory size of the Linux kernel

  - Currently, a collection of about 40 patches

    - Had as many as 110 patches at one time

    - Some patches mainlined, some are out-of-date

Linux-tiny Patch Areas

- Configurable static data structure size

- Configurable code elimination

  – Eliminate a subsystem or feature, depending on kernel configuration

- Moving inlines into stand-alone functions

- Kernel instrumentation and analysis tools for memory usage reporting

Linux-tiny History

- Started in 2003 by Matt Mackall

- CELF sponsored Matt in 2005/2006

- Matt mainlined the top 17 patches from Linux-tiny

- Project was mostly abandoned in 2006
  - For a while, was not maintained relative to recent kernels

Current status

- CELF is reviving the project

- New maintainer volunteered at Ottawa Linux Symposium, 2007:
  - Michael Opdenacker

- Michael is an experienced embedded Linux trainer
  - Has his own training company, Free Electrons

Status (cont.)

- Have not formally announced the new maintainer

  - Watch celinux-dev or kernel mailing list next week

- Lots of work recently by Sony

  - Up-port to 2.6.22.5

  - Converted kmalloc-accounting feature to slab-accounting

    - Fixed lots of bugs

    - instrument all cache-related dynamic allocations

Results

Config option	PC size	OSK size
NET_SMALL	8192	6368
PROC_KCORE	2556	0 ?
SYSENTER	7029	not applicable
AIO	8114	10396
XATTR	3780	0 error (have fix)
FILE_LOCKING	116228	442840 (error in test code?)
ETHTOOL	5340	7328
INETPEER	2848	3188
NET_SK_FILTER	3988	4008
NET_DEV_MCAST	2098	2152
IGMP	0 error	13112
BINFMT_ELF_AOUT	1416	2032
IDE_HWIFS	9216	6208
(others: MAX_SWAPFILES_SHIFT, NR_LDISCS, MAX_USER_RT_PRIO,SERIAL_PCI, PCI_QUIRKS)	25456	5152
Total	196261	59944

Slab Accounting Feature

- Records all callers to dynamic memory allocation system (slab cache) in kernel

- Tracks statistics for each caller

- To use:
  - Turn on DEBUG_SLAB and DEBUG_SLAB_ACCOUNT
    - On the Kernel Hacking menu
  - cat /proc/slab_account

Slab Info Analysis Programs

- Slabalyze

  - Collects information from /proc/slabinfo

  - Shows overhead used by different caches

  - Can sort by total memory, overhead, etc.

- casort - Cache accounting sort

  - Collects information from /proc/slabaccount

  - Shows callers, sorted by different fields

Demonstration

- On OSK machine in US test lab
  - if we are lucky…

What is next?

- Update documentation:
  - Linux kernel size tuning guide
  - Linux-tiny patch status matrix
    - Have automated tool for testing Linux-tiny patches
- Want to get cache_accounting working on slob allocator
- Want runtime testing of existing patches
- Please download and test the code
  - Every bug report is important
- Will start trying to mainline sub-patches again, this fall!

Resources

- Web site:
  - http://elinux.org/Linux_Tiny

- Instructions:
  - http://elinux.org/Kernel_Size_Tuning_Guide
    - Will update soon (goal is by next week)

- Mailing List:
  - linux-tiny@selenic.com

Open Discussion