# Do manual pages matter?

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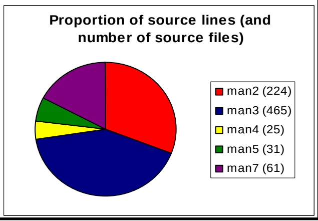
## Outline

## The *man-pages* project

- Project started 1993
- Documents Linux kernel-userland API...
- and (GNU) C library API
- Sections 2, 3, 4, 5, and 7 of manual pages
- Target audience: userland programmers...
- and kernel developers

## Contents of *man-pages*

- As at *man-pages-2.44*:
  - ~800 man pages (== ~2000 printed pages)
  - 2: syscalls
  - 3: library functions (*glibc*)
  - 4: devices
  - 5: file formats
  - 7: overviews, etc



*"Documentation is fantasy: you have to read the source code to know the truth."*

## Time!

- The kernel is **big**:
  - 2.6.19 kernel source (`*.[chS]`) is **7.3M lines**
- and constantly changing:
  - Typical Linux 2.6.x *diff −u* patch > **1M lines**

## Reading the source doesn’t cut it

- Reading the source gives the “right” answer
- but... too **slow** (and **hard**, especially for userland programmers)
- We just don’t have the time...

## We need summaries of the code

- Understanding of code must be mediated by *natural language* summaries
- Discussions
  - oral + email
  - Take place during development
  - but... not so useful later
- Documentation
  - most useful form of summary for later

## Man pages do matter!

Background
Man pages: a counter-argument
Man pages matter for kernel developers
Problems maintaining man pages
How to help

## Why man pages matter for kernel developers

- Publicity
- Identifying bugs
- Better testing (reducing # of released bugs)
- Better interface design
- Better interface consistency

## Identifying bugs

- Software is an *implementation* of an *intention*
- *bug* == intention – implementation
- Without documentation, how do we know whether implementation matches intention?
- And how can we test?

## Testing

- Problem: too many bugs in released interfaces
- Why? Insufficient testing before release

## Documentation and Testing

- Documentation can help reduce bugs
- Evidence: the process can work in reverse...

## Testing – example 1

***inotify***

- File change notification API
- Appeared in kernel 2.6.13
- 2.6.16-rc timeframe, I wrote *inotify(7)*
- Testing: `IN_ONESHOT` had *never* worked
- Bug reported; fixed for 2.6.16

## Testing – example 2

***splice()***

- transfer data between file descriptors without going through user space
- Appeared in kernel 2.6.17
- Simple test programs easily caused hangs
- Bug reported; fixed for 2.6.18

## Testing: conclusions

- Documentation goes hand in hand with testing
- Documentation broadens range of testers
- Testers can determine if *implementation* == *intention*
- Good, early documentation → more & earlier testing → fewer released bugs

## Interface design

- It's hard to design a good programming interfaces
- Getting design wrong is painful...
  - Using interface is difficult, and bug-prone
  - Difficult/impossible to change design

## When interface design goes wrong

*dnotify* (kernel 2.4; file change notification)

- Many problems in interface design
- Problems led to replacement by *inotify*
- But... is the problem the developer(s)?
- Or the process?

## Interface design: man pages help

- Writing a man page (or other doc) can help with interface design
- Writing documentation leads to self-review by implementer(s)
- Documentation broadens audience who can understand and critique design

## Interface consistency

- The problem: some new interfaces are inconsistent with existing similar interfaces
- Man pages can be used as a reference when designing new interfaces

## Interface consistency: right

***mbind(MPOL_MF_MOVE_ALL)***

- NUMA memory binding interface
- Requires privilege (`CAP_xxx`)
- Initial (-rc) implementation used `CAP_SYS_ADMIN`
- Reading *capabilities(7)* showed that existing related APIs used `CAP_SYS_NICE`
- Final implementation used `CAP_SYS_NICE`

## Interface consistency: wrong (1)

- Various memory-related syscalls specify a *start* address + a *length*
- Some APIs (e.g., *mprotect(start, length, ...)*):
  - Require *start* to be multiple of page size
  - Round *length* up to next page boundary
- Some other APIs (e.g., *mlock(start, length)*):
  - Round *start* down to page size
  - Round *length* up to next page boundary
  - *mlock(4000, 6000)* affects bytes 0..12287

## Interface consistency: wrong (2)

*remap_file_pages(start, length, ...):*

- Why settle just for inconsistent...
  - Round *start* down to page boundary
  - Round *length* **down** to page boundary(!)
- ... when you can also have bizarre:
  - What address range is affected by *remap_file_pages(4000, 6000, ...)* ?

## Problems maintaining *man-pages*

- Much to do; too few people
- Many man pages yet to be written
- Many existing man pages are stale
- Kernel developers have much valuable knowledge, but are largely absent
- How to know if an interface has changed?
- How to know if a man page is broken?

## How to help

- Just about anyone can help
- Kernel developers would benefit by helping
- How companies could help

## Helping: anyone

- Read `HOWTOHELP` in *man-pages* tarball
  - List of missing pages
  - How to obtain list of FIXMEs
  - Tips on how to help in the most helpful way
- Latest tarball at:
  `http://www.kernel.org/pub/linux/docs/manpages`

## Helping: kernel developers

- Adding/changing an interface?...
- Write/update the manual page!
- Can't bear messing with *groff*?
  - Submit plain text!
- Please provide test programs...

## Helping: kernel developers

- System call man pages belong in *man-pages*, not separate tarballs
- Many virtues in a consolidated set of man pages:
  - Formatting consistency
  - Single known address for man pages patches
  - Distributors know where to find manual page
  - Consistent interfaces...

## Helping: kernel developers

*"This [part of the] interface shouldn't be documented, because userland shouldn't be using it [it's only intended for use in libraries]."*

- Library developers are in same position as everyone else
- "*no documentation*" doesn't always mean "*don't use this*"
- Best approach: document interface with warning about usage

## A proposal for kernel developers

- Create and enforce a policy that **requires** interface changes to be accompanied by documentation and test programs

## Before saying no...

- Consider that good documentation can help prevent:
  - Poorly designed/inconsistent interfaces
  - Bugs in new and changed interfaces
- Look at long list of FIXMEs and missing pages
- There are kernel coding standards; why not documentation (and testing) standards?

## Helping: companies/organisations

- Fund a *man-pages* maintainer
  - Write/update pages
  - Vet patches
  - Test new interfaces
  - Track standards work (POSIX.1-200x/SUSv4 and beyond)
  - Write/choose a style guide
  - Maintain a website

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Thanks!

www.kernel.org/pub/linux/docs/manpages