A HIGHLY RELIABLE OPERATING SYSTEM

MINIX 3, why bother?

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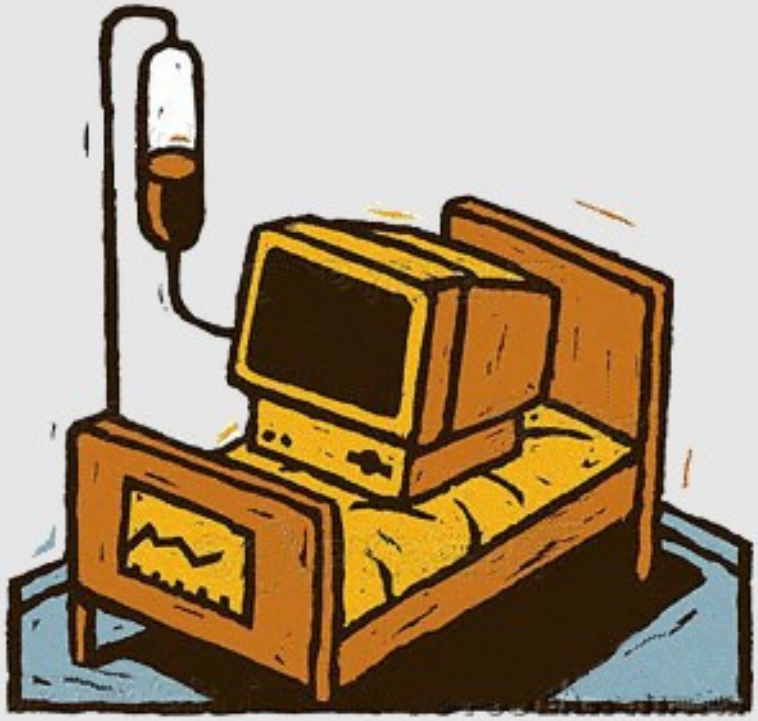
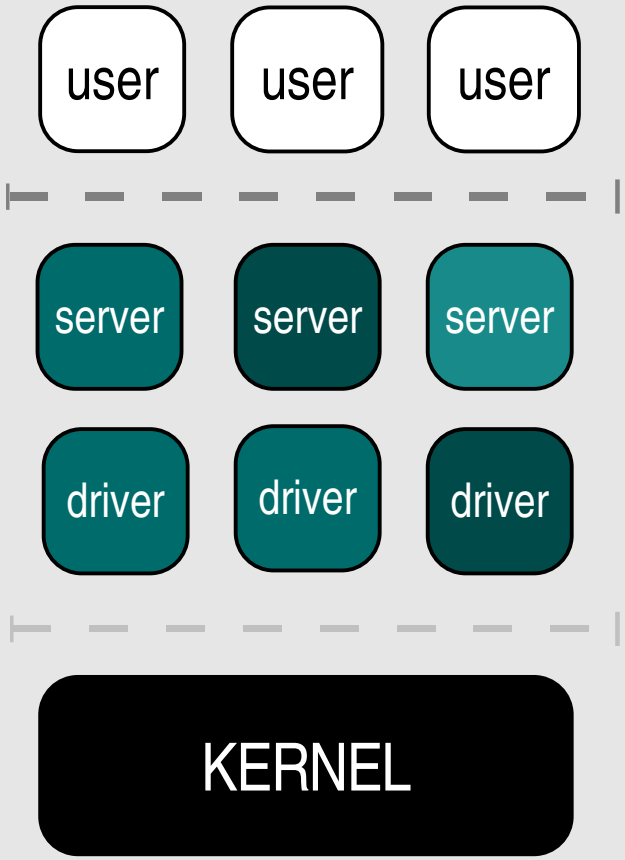


WHAT'S WRONG?

- Users demands more dependable system
  - Tradeoff with other requests is changing
  - Different usage patterns, e.g., mobile devices
- Monolithic design undermines robustness
  - Kernel modules (drivers) can crash entire system
- Viruses, worms, spyware, etc.
  - Your computer is under attack!

DESIGN FOR DEPENDABILITY



- Multiserver operating system
- Based on tiny microkernel

- MINIX 3:
  - Reliability
  - Availability
  - Security

CHARACTERISTICS OF MINIX 3

- Minimal kernel to support user-mode OS
  - Stable kernel (~4000 LoC) reduces number of fatal bugs
- User-mode modules are physically isolated by MMU
  - Memory access must be explicitly granted by other party
- Privileges of each components are strongly restricted
  - Policies for IPC, kernel calls, I/O, memory, scheduling
- Servers and drivers are carefully monitored
  - Failures can be detected and often automatically repaired
- TCB is reduced by over two orders of magnitude
  - Minimal set of servers comprises about 20,000 LoC

WHY BOTHER?

- Reliability and security become more important!
  - E.g., think of banking on embedded devices
- Starting to become useful operating system
  - E.g., recently the X Window System was ported
- Open source project (under BSD license)
  - You can inspect, modify, contribute, etc.
- Free, limited-edition MINIX 3 live CD-ROM
  - Come and get your CD-ROM at our stand!

MINIX 3: PERFORMANCE

- Time from boot monitor to login is under 5 sec
- Full build of minimal system within 4 sec
- Overhead for typical applications about 6%
- File system and disk I/O overhead about 9%
- Disk throughput with DMA up to 70 MB/sec
- Fast Ethernet easily runs at full speed
- Ethernet recovery every 4 sec costs 8%

SUMMARY & CONCLUSION

- Fundamental problems with monolithic systems
- Our approach to OS dependability: MINIX 3
  - Full compartmentalization
  - Principle of least authority
  - Fault tolerance and recovery
- Your contribution is very welcome!
- Get a free MINIX 3 Live CD-ROM ...
- Or visit the website: www.minix3.org

THANK YOU

- The MINIX 3 team
  - Jorrit Herder
  - Ben Gras
  - Philip Homburg
  - Herbert Bos
  - Andy Tanenbaum
- More information
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