



SPIN Operating System

Brian Bershad, Stefan Savage, Przemyslaw Pardyak,
Emin Gun Sirer, Marc E. Fiuczynski, David Becker,
Craig Chambers, Susan Eggers (UW)

Presenter: Alex Li



Background

- Developed at University of Washington
- Introduced in 1995 (SOSP'95), under development for ~2 years
- Achieve goals by combining researches in
 - Systems
 - Languages
 - Compilers
- <http://www-spin.cs.washington.edu/> still “SPIN”ing



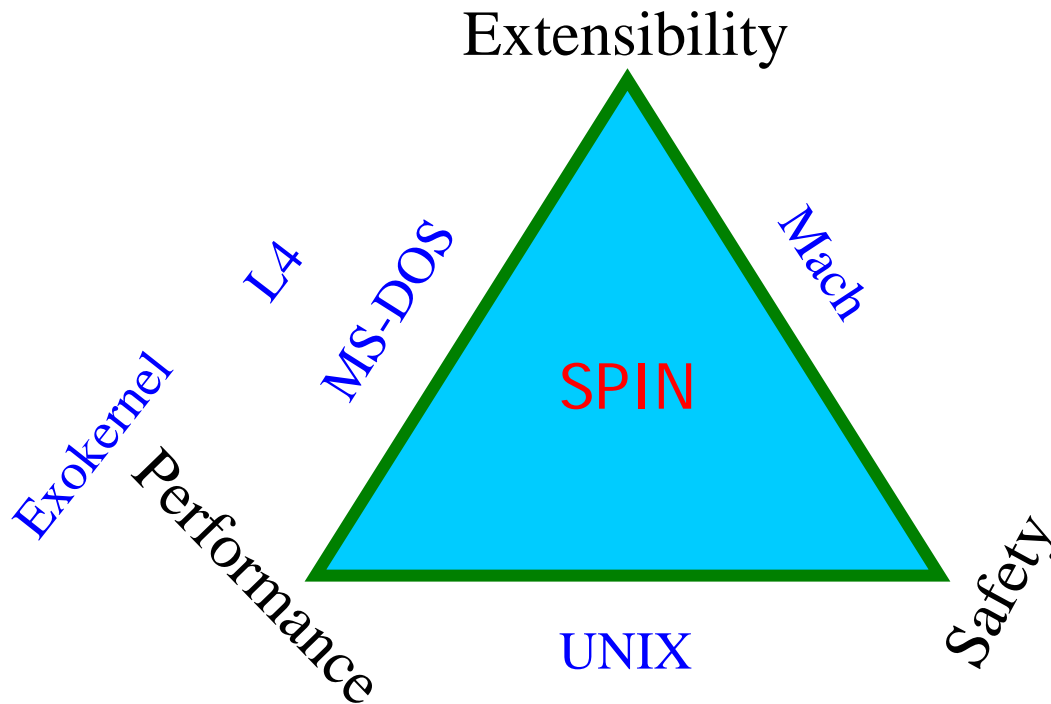
Goals

- Extensibility
 - Applications can dynamically extend system to provide specialized services
- Safety
 - Kernel is protected from actions of extensions
- Performance
 - Extensibility and safety have low cost



Challenges

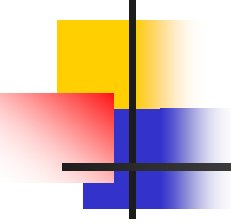
- OS that is extensible, safe, and fast.





Approach

- Put extension code in the kernel
 - Cheap communication
- Use language protection features
 - Static safety
- Dynamically interpose on any service
 - Fine-grained extensibility

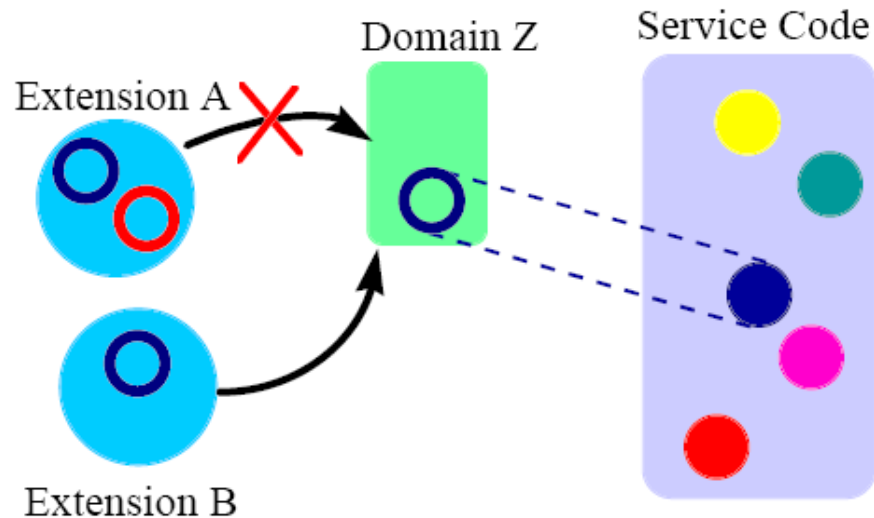


Safety (1 of 2)

- Modula-3
 - Memory safe
 - Hide resource with interfaces
 - Cheap capabilities

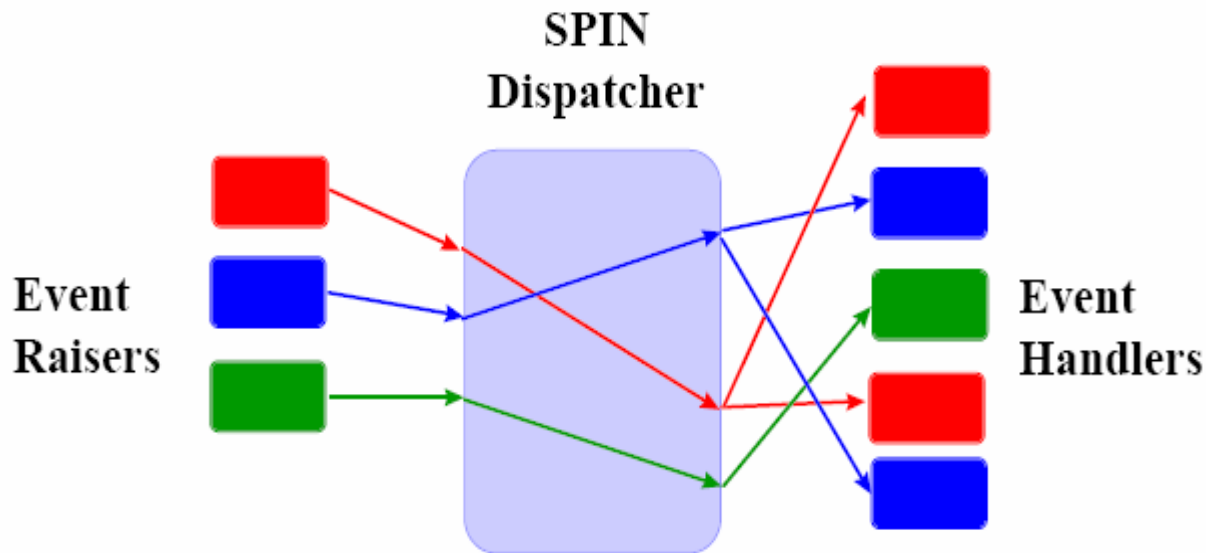
Safety (2 of 2)

- Restricted dynamic linking
 - Control interface access cheaply



Extensibility (1 of 2)

- Fast and safe centralized control transfer switch
 - Event-based comm. model (raise, dispatch, handle)

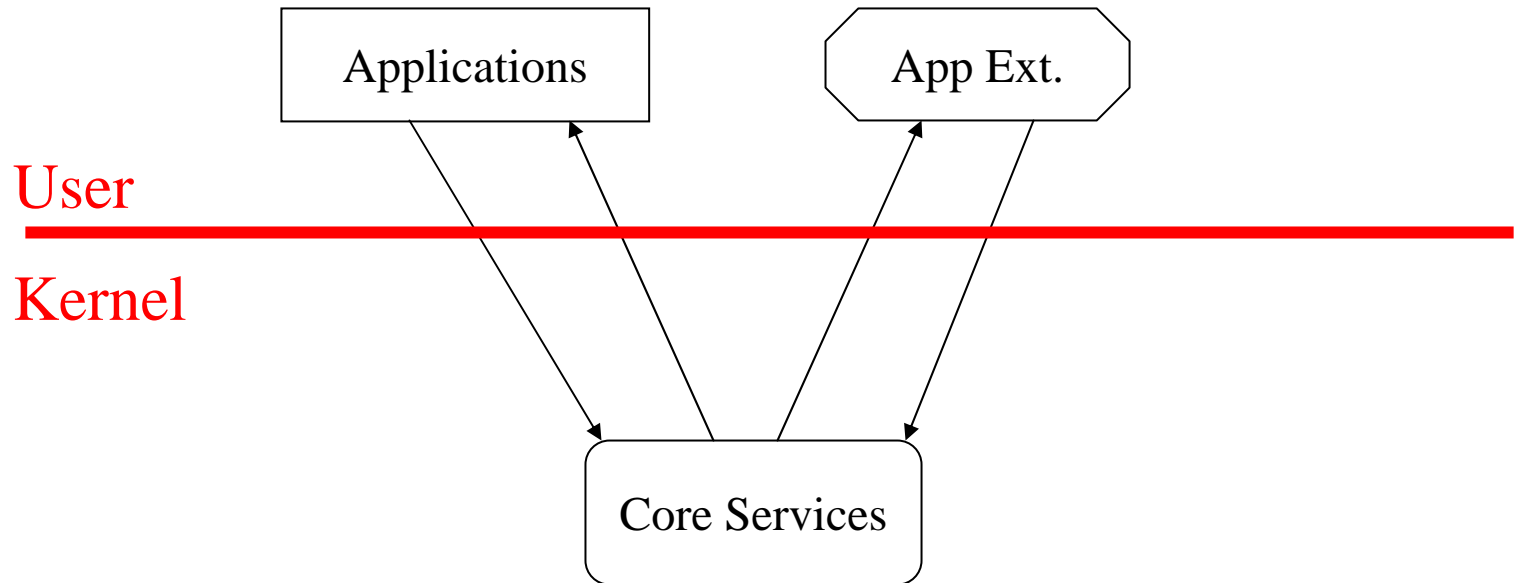




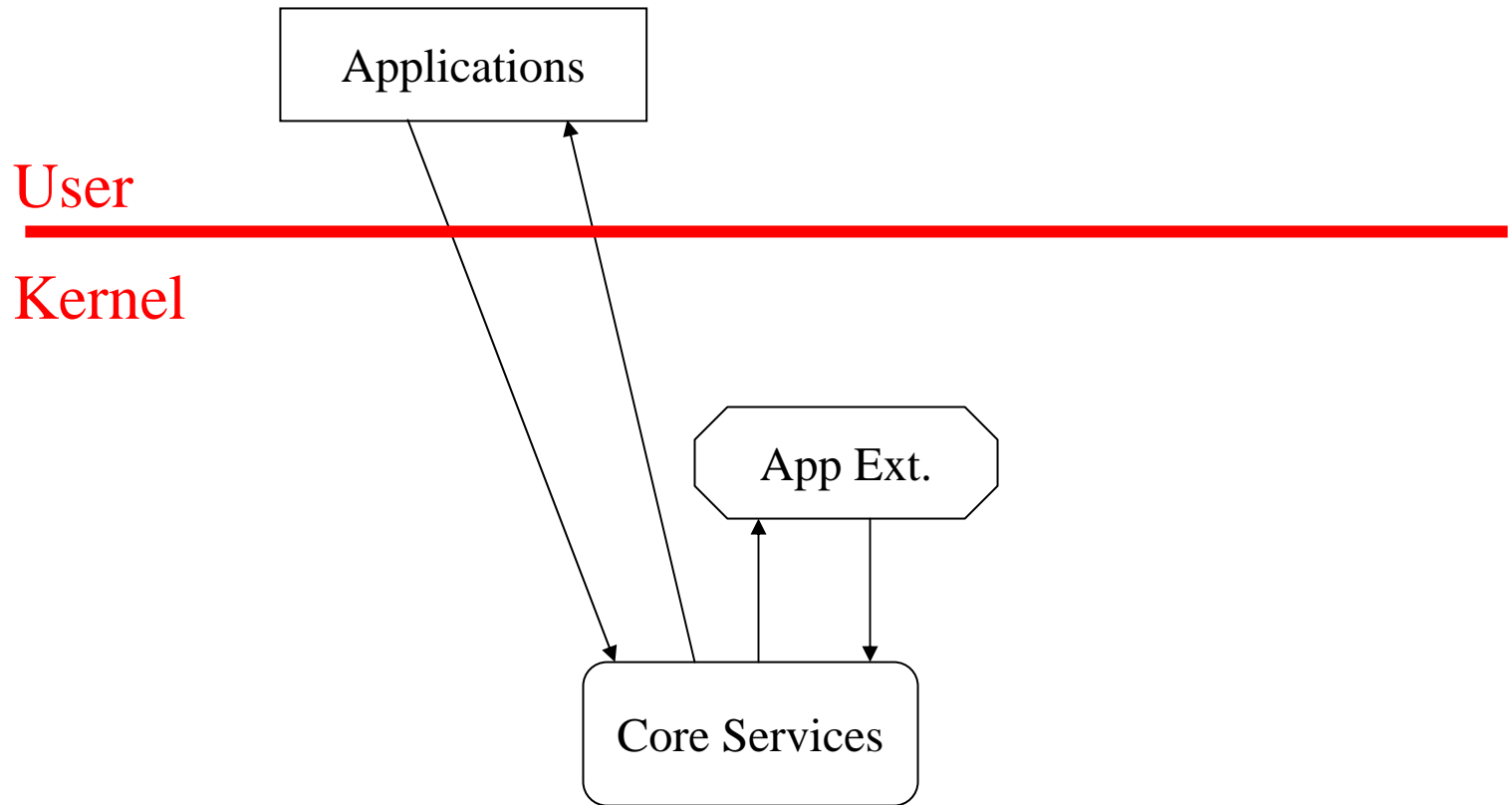
Extensibility (2 of 2)

- Almost all “system” services are extensions
 - E.g. network protocols, file sys, sys call interface, etc.
- Core services cannot be safely implemented as extensions
 - E.g. Proc exec state, MMU interface, dyn linker

SPIN Extensions



SPIN Extensions



SPIN Structure

OSF/1
Unix server

Unix
Apps

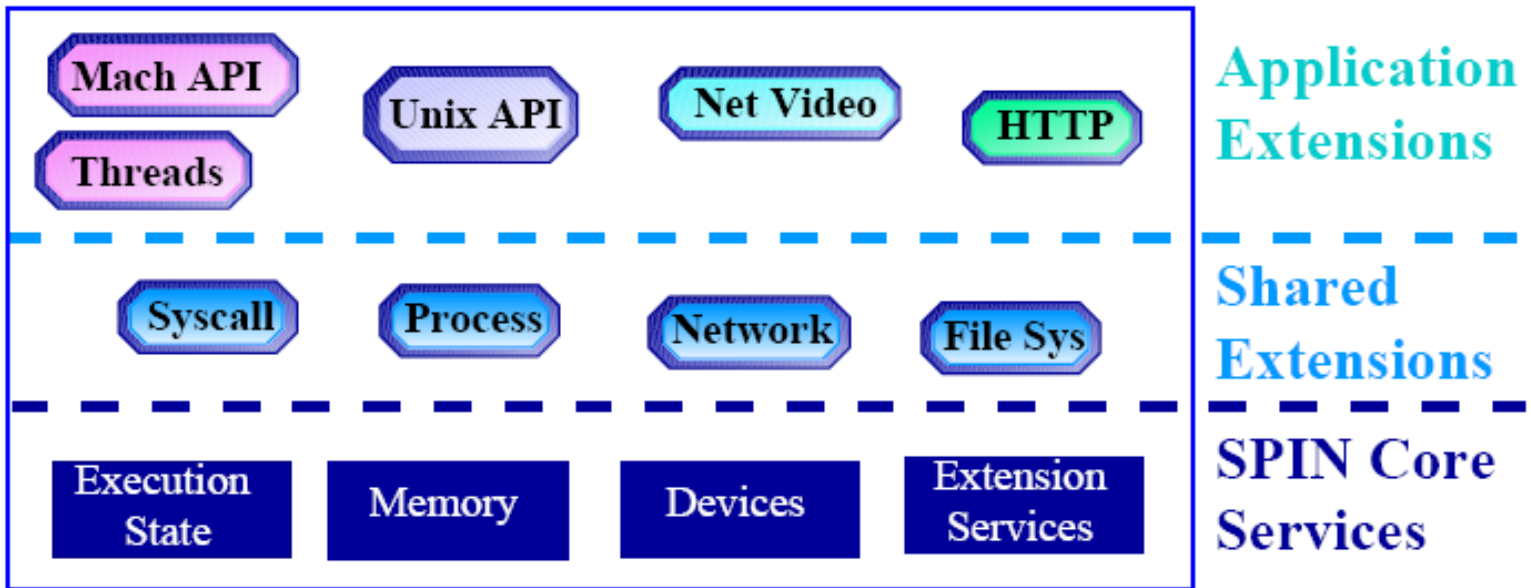
Video Server

Web Server

Applications

User

Kernel





Performance

- Extensions close to kernel services
 - Low latency: response and invocation
- Allow fast and safe fine-grained service extensions

Conclusions

- Single system with extensibility, safety, and performance possible
- Achieved thru systems, languages, and compilers researches
- <http://www-spin.cs.washington.edu/>

