


# Plan 9





# Background & Motivation

- Developed at Bell Labs in the late 1980s
- Released as open source in 2002
- A response to Unix
- Is a full-fledged OS
- Can run on x86, Intel, MIPS, ALPHA, Sparc, PowerPC, and ARM

# Design

- Similar goals as microkernels
- Design decisions
  - Hierarchically named objects
  - No distinction between remote and local
- Moves objects out of the kernel
- Objects are mostly portable

# Design II - Objects

- User builds environment as a collection of objects
  - Portability
  - Feature: Union directories
- Examples: /bin, /dev, /proc
- Many system calls can be simplified or eliminated



# Design III - Namespace

- Every process has its own namespace
  - Can alter without affecting other processes
- Example: In a window system each window process has its own `/dev/bitblt`

# Kernel – 9P

- Communication is the central design
- 9P low-level networking protocol
  - All objects use 9P to communicate
- Half of the kernel is 9P

# Kernel II – Parallel Programming

- Fine-grained process resource control
- Efficient system call interface, cheap process creation and scheduling

Test	Plan 9	IRIX
Context switch	39 $\mu$ s	150 $\mu$ s
System call	6 $\mu$ s	36 $\mu$ s
Light fork	1300 $\mu$ s	2200 $\mu$ s
Pipe latency	110 $\mu$ s	200 $\mu$ s
Pipe bandwidth	11678 KB/s	14545 KB/s

# References

- Plan 9 from Bell Labs - <http://cm.bell-labs.com/plan9/>
- Plan 9 - [http://en.wikipedia.org/wiki/Plan\\_9\\_%28operating\\_system%29](http://en.wikipedia.org/wiki/Plan_9_%28operating_system%29)