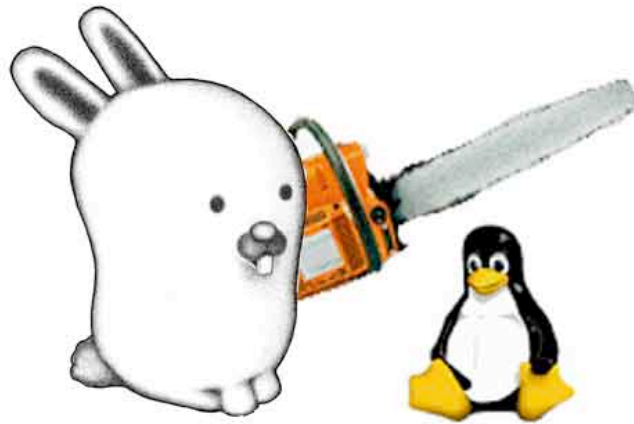


# Plan 9 from Bell Labs



“UNIX++ Anyone?”

Anant Narayanan  
Malaviya National Institute of Technology  
FOSS.IN 2007

# What is it?



Advanced technology transferred via mind-control  
from aliens in outer space

Humans are not expected to understand it

(Due apologies to [lisperati.com](http://lisperati.com))

# Yeah Right

- More realistically, a distributed operating system
- Designed by the creators of C, UNIX, AWK, UTF-8, TROFF etc. etc.
- Widely acknowledged as UNIX's true successor
- Distributed under terms of the Lucent Public License, which appears on the OSI's list of approved licenses, also considered free software by the FSF

# What For?

*“Not only is UNIX dead, it’s starting to smell really bad.”  
– Rob Pike (circa 1991)*

- UNIX was a fantastic idea...
- ...in it’s time - 1970’s
- Designed primarily as a “time-sharing” system, *before* the PC era

# A closer look at Unix TODAY

It Works!

But that doesn't mean we don't develop superior alternates

# GNU/Linux

- GNU's not UNIX, but it is!
- Linux was inspired by Minix, which was in turn inspired by UNIX
- GNU/Linux (mostly) conforms to ANSI and POSIX requirements
- GNU/Linux, on the desktop, is playing “catch-up” with Windows or Mac OS X, offering little in terms of technological innovation

# Ok, and...

- Most of the “modern ideas” we use today were “bolted” on an ancient underlying system
- Don't believe me?

# A “modern” UNIX Terminal

USER

WINDOW



PROCESS

```
$ stty
speed 38400 baud;
lflags: echoe echok
echoke echoctl pendin
oflags: -octabs
cflags: cs8 -parenb
```

**EH?**



# Where did it go wrong?

- Early UNIX, “everything is a file”
- Brilliant!
- Only until people started adding “features” to the system...

# Why you shouldn't be working with GNU/Linux

- The Socket API
- POSIX
- X11
- The Bindings “rat-race”
- 300 system calls and counting...
- Why isn't everything a file all of a sudden?

**What's the solution?**

- Take a step back and think about the “everything is a file” approach
- Throw the POSIX specification into the dustbin

# Welcome Plan 9!

- Uniform interface to all resources
- Why should I care if a device is a ‘char’ or a ‘block’?
- No files are more “special” than others

# 9P

- *One protocol to bind them all*
- 9P is Plan 9's "VFS"
- 13 basic operations including read, write, stat et. al.
- All resources are required to implement them
- Minimalist and Lightweight, can work over any reliable transport: TCP, Shared Memory, Serial Ports, PCI Bus etc.

# The File Server

- Unlike what you may expect, a file server in Plan 9 is just something that “serves” resources in the form of files
- Hence, the kernel is often called a “server multiplexer”, not an “I/O multiplexer” like UNIX was
- Thanks to 9P, it doesn’t matter whether resources are local or remote, applications use them transparently without even knowing

# Example “Servers”

- Networking: /net
- Email: /mail/fs
- Graphics: /dev/draw
- Window System: /dev/wsys
- Process Control: /proc
- cdfs, webfs, tarfs, ftpfs, wikifs



# Namespaces

- Per-process namespaces
- A process' own “view” of the filesystem
- Can be used to implement some neat stuff!
  - Start a window manager inside another transparently, because `/dev/draw` for the one inside is different than the one for the parent!

# No bindings!

- Since everything is file-based, you don't need to:
  - Use C all the time
  - Write bindings for every new feature-set
- As long as your language can read and write files, you're good to go

# Trivia



Plan 9 was named after the worst movie ever made in the history of American Film

(Lookup IMDB)

Ok, I'm convinced  
How can I help?

Learn the “Plan 9 Way”

**Tools at your disposal**

# Rio

- Plan 9's Window Manager
- A window in Rio is a real window, not a “terminal emulator” because we don't use terminal anymore
- Everything is just text - cut / copy / paste at will!
- And yes, you need a (3-button) mouse :)

# Acme

- The programmer's editor
- Again, all text is editable
- Can also be used as a file manager
- No, there's no syntax coloring (yet!)

# Compiler Suite

- One compiler and linker per architecture (MC68000/020, ARM, Alpha, x86, AMD64, SPARC, SPARC64, PowerPC, MIPS and more on the way)
- A new “Makefile” style system for maintaining code - mk
- Very fast - No dynamic libraries
- Robust debugging system *acid*



# Fossil and Venti

- Venti - block storage indexed by hash; duplicated blocks stored only once
- Fossil: Uses Venti for storing snapshots of files
- Try the *history* and *yesterday* commands
- Mac OS X comes up with this idea for Leopard in 2007, was in Plan 9 since before I was born!

# Factotum

- Much like a “keyring”, does authentication on your behalf
- Speaks a variety of protocols
- All your keys are stored in *secstore* encrypted in a “master” key

# Security

- There is no root user
- Everyone has the same privileges (i.e. nothing)
- Namespaces provide isolation by default
- The file-server has a “sys” group, add yourself to it if you want to, for example, install a new kernel for everyone to use

# Concurrency

- Did you also remember to throw *pthread*s into the dustbin?
- “Communicating Sequential Processes” introduced by Hoare in 1978 based on Dijkstra’s work
- OS handled *processes*, co-routines within a process are called *threads*
- C/libthread, Limbo, Occam, Erlang

# Native UTF-8

- UTF-8 was invented by Ken Thomson and Rob Pike *for Plan 9*
- All text in Plan 9 is UTF-8 (which is why it is backward-compatible with ASCII)
- Internationalization was added to Linux as an *afterthought*
- This is especially relevant in countries like India

# What Plan 9 Doesn't Have

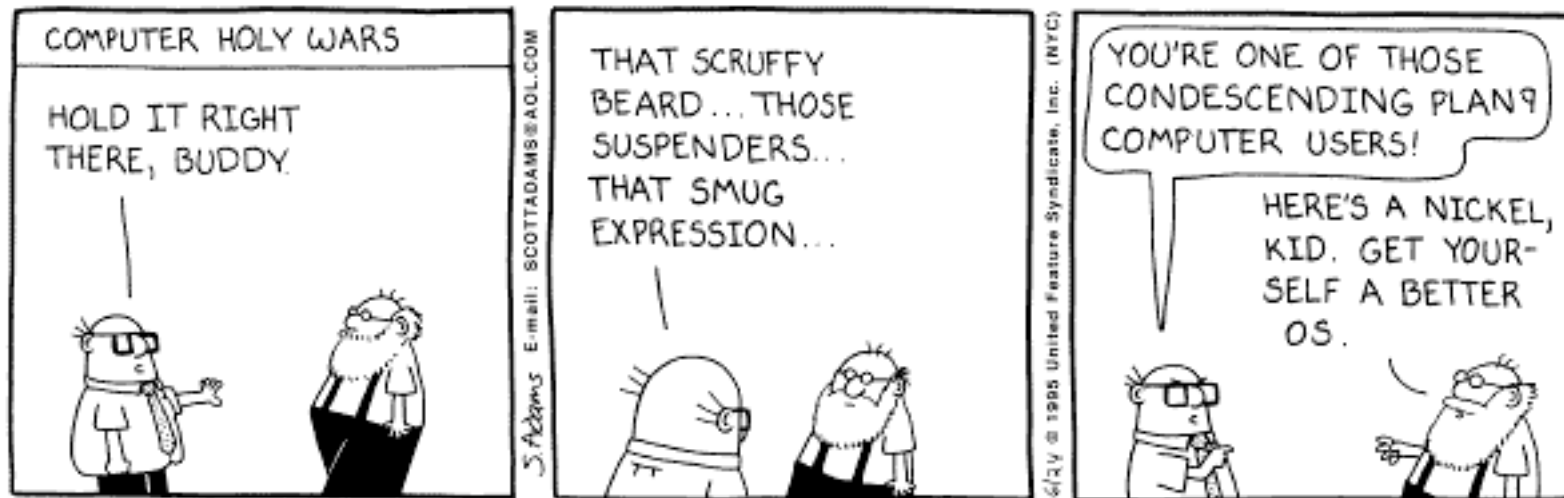
- root, suid, tty, curses
- ioctl, sockets, select, poll, symlinks
- pthreads, mmap
- locales
- gcc, C++, emacs, vi
- X11, XML, “Web 2.0”
- ... and that’s a good thing (TM)

# But we also don't have

- Good video players
- A 3D graphics system
- Eye-candy
- Javascript-enabled web browser
  
- Most people have been managing by vnc'ing into other machines, so far
- That's where YOU, as a developer, come in



# The Community



You thought the BSD folks were arrogant?  
You ain't seen nothing yet!

# Contributing

- Be prepared to *unlearn* what you have *learnt* so far
- Plan 9 has an in-built patch and update system, any user can submit patches straight from the OS
- Not a conventional FOSS project, there's no “version control” or “ticketing system” as such
- The mailing list and IRC channels are usually active

# Getting Involved

- Subscribe to the 9fans list (you get to interact with legends as a side-effect)
- Hang out in our IRC Channels
- Install Plan 9 (on your VM?)
- Get Hacking!
- Encounter a problem? Post...
- Rinse and Repeat
- Announce your creation proudly (but be prepared for the bashing!)

# What you can do

- Develop applications for Plan 9
- Port applications to Plan 9 (not fun and definitely not recommended, but...)
- Improve Plan 9 itself
- Fix Bugs
- Port Plan 9 applications to other OSes (plan9port)
- Frequent contributors get their very own 'contrib' directory

# The Rewards

- The warm fuzzy feeling of contributing to FOSS
- You learn a **lot** more than you would contributing to your run-of-the-mill FOSS project
- You work with the tools of the **future**, not the present
- You **change the way** you look at computer science. No kidding.

# Not Ready for it yet?

- Smooth your transition with:
  - “Plan 9 From User Space” - A port of the most common Plan 9 utilities to POSIX systems
  - Inferno - A operating system inspired by Plan 9, can be run in “hosted mode” which essentially means the OS in your current OS (runs on POSIX systems and Windows)
  - Standalone versions of Acme

~~Any Questions?~~

Any Rants?

Thank You!

[anant@kix.in](mailto:anant@kix.in)

<http://www.kix.in/plan9/>

<http://plan9.bell-labs.com/plan9/>

<http://swtch.com/plan9port/>

<http://www.vitanuova.com/inferno/>

#plan9 on irc.freenode.net