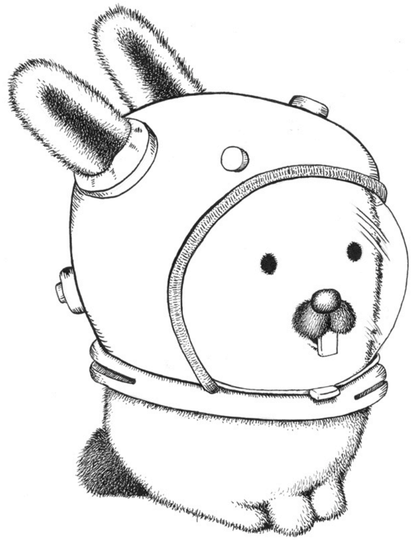
Plan 9 From Bell Labs



"UNIX++ Anyone?"

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FREED.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)

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

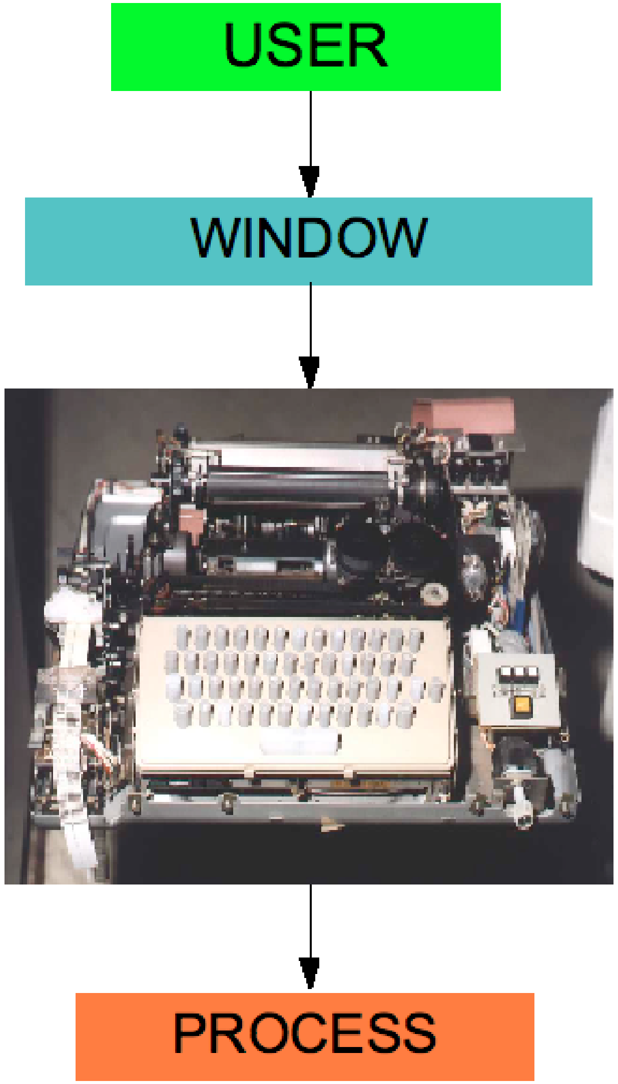
GNU/Linux

- 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: -oxtabs
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...

Networking

- More computers were beginning to be networked, UNIX had to do something...
- BSD came in with the “wonderful” socket idea - added a handful of system calls...

The Irony

- We should represent devices as files too!
- More filesystems began to appear and we had a VFS layer introduced along with the sockets
- Hey, what about filesystems in user-space?!
- Welcome the FUSE and sysfs projects
- That's not all, ever understood *ioctl*?

Linux Today

- Multiple interfaces, Multiple resources
- The original path and file model broke completely
- /etc/passwd, /dev/sda, /proc/cpuinfo are NOT the same and require *different* interfaces for interaction
- 300 system calls and counting...

X11

- The graphics system for Linux
- Why isn’t “everything a file” all of a sudden?
- You only need to learn around 1000 function prototypes starting with ‘X’ to create graphical programs

The “bindings” rat-race

- Oh no - system, sockets, and X11 calls are available only in C!
- Hey, no problem, we can “bind” these function calls to equivalent ones in other languages
- 1/10th of FOSS projects consist of these “bindings”, a race you’ll never win

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 that 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

EXCLUSIVE MIKE NELSON AUTOGRAPHED COLLECTOR'S EDITION
ED WOOD'S CLASSIC
PLAN 9 FROM OUTER SPACE
IN COLOR
FIRST TIME IN COLOR
ALSO INCLUDES RESTORED ORIGINAL BLACK AND WHITE VERSION

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

(Lookup IMDB)

Applications

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 *pthreads* 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

COMPUTER HOLY WARS
HOLD IT RIGHT THERE, BUDDY.
S. Adams
E-mail: SCOTTADAMS@AOL.COM
THAT SCRUFFY BEARD... THOSE SUSPENDERS... THAT SMUG EXPRESSION...
6/24 © 1995 United Feature Syndicate, Inc. (NYC)
YOU'RE ONE OF THOSE CONDESCENDING PLAN9 COMPUTER USERS!
HERE'S A NICKEL, KID. GET YOURSELF A BETTER OS.

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

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!

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http://swtch.com/plan9port/
http://www.vitanuova.com/inferno/

#plan9 on irc.freenode.net
#linux-india is fun too!