

Plan 9 from Bell Labs

Plan 9 from Bell Labs

- Plan 9 from Bell Labs is a network operating system and it is composed of separate machines acting as
 - CPU servers
 - file servers
 - terminals
- it is built from distinct specialised components
 - rather than similar general purpose components
- high performance general purpose components cost a lot of money
 - workstations is too slow and IO bound for fast compilation
 - too expensive just to be used as a windowing system

```
MOVIE GOOFS AND INTERESTING FACTS LIST
Version 3.9 (October 1993)
A collection of film flubs, cinematic slip-ups,
movie mistakes, Hollywood howlers, etc etc.
Compiled by Murray Chapman and Michael Gaines
(renderl@teak.njit.edu)
Found by the users of USENET.

# Plan 9 from Outer Space
- Bela Lugosi died two days into the
shooting of this turkey.
He was replaced by the director's
wife's chiropractor,
who was significantly taller than Lugosi,
and played the part with a cape
covering his face.
- Internationally recognised as the worst
movie ever made.
```

Plan 9 from Bell Labs

- Plan 9 approach is based on distributed specialisation would better address issues:
 - cost effectiveness
 - maintenance
 - performance
 - reliability and security
- radical steps taken
 - build a completely new system
 - C compiler, operating system, network software, command interpreter, window system and terminal!
- authors credentials?
 - Rob Pike - famous for many of UNIX concepts during the early years
 - Ken Thompson - wrote the first C compiler. Then worked on translating UNIX from assembler to C
 - AT&T - birth place of UNIX - so wealthy that the USA divided AT&T into two because of its power

Plan 9 from Bell Labs

Plan 9

- different from other research and commercial operating systems. It lacks features often associated with other research network operating systems
 - process migration
 - lightweight processes
 - distributed file caching
 - personalised workstations
 - support for X windows

Plan 9

- built around CPU servers (large multiprocessors)
 - file servers
 - terminals (bitmap screen, mouse & computer running a window system 8 1/2)
- sharing of computing and storage services provide a sense of community for a group of programmers
 - cost effective
 - simplifies management and administration

CPU Servers

- in 1990 the production CPU server was a Silicon Graphics Power Series machine with four 25 MHz MIPS processors
 - 128 Mbyte memory
 - no disk
 - 20 Mbyte/sec DMA interface to the file server
 - Ethernet network interface

CPU Servers

- operating system has conventional process model using
 - fork
 - exec primitives
- new processes are run on a new processor whenever possible (similar to Amoeba in this respect)
 - processors similar to disk blocks
 - buy more disk space when you run out
 - buy more processors as well
- CPU servers have *no* local disk

File Servers

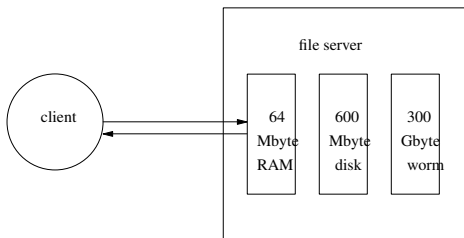
- Plan 9 file server is a modest
 - two processor
 - 64 Megabyte of memory
 - 600 Megabytes of hard disk
 - **300 Gigabyte juke box of write-once optical disk (WORM)**
- it interfaces to the CPU servers through the 20 Mbyte/sec DMA links

File Servers

- file server interfaces to other terminals through conventional networks
- file server presents a file system to its clients *not an array of disk drives*
 - different from Windows in this respect. cf a : b: c: d: e: f:

File Server (continued)

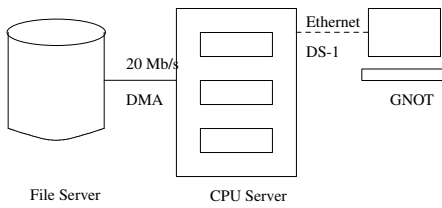
- file system actually resides on WORM
 - the modest 600 Mbyte drive *only* acts as a cache
-



File Server Security and Backup

- once a day the file tree is frozen and split
 - old files can be accessed through normal file operations
 - /1990/0401/usr/rob/doc/plan9.ms
- this scheme permits users to compare files against old versions using traditional tools applied to a normal file system
 - permissions are the same
 - security remains intact

Plan 9 Network Structure



GNOT terminal

- specialist terminal whose specification is:
 - 25 MHz 68020
 - 1024x1024 4 colour display
 - keyboard and mouse
 - 4..8 Mbytes of memory
 - 2 Mbit/sec packet switched network connects a GNOT to the CPU servers
- terminal does not handle compilation
 - might run a text editor though

Plan 9 GNOT

- cheap enough so that each person can have 2
 - 1 at work
 - 1 at home

Plan 9 code size statistics

- window software written from scratch
 - 8 1/2 source is 60K bytes including source for xterm equivalent
 - roughly functionality of X windows (no colour)
 - 3860 lines of code and compiles in 10 seconds
 - compare to X windows!
- Plan 9 is small!
 - the kernel is 3647 lines of C code
 - it takes 10 seconds to compile and 10 seconds to load