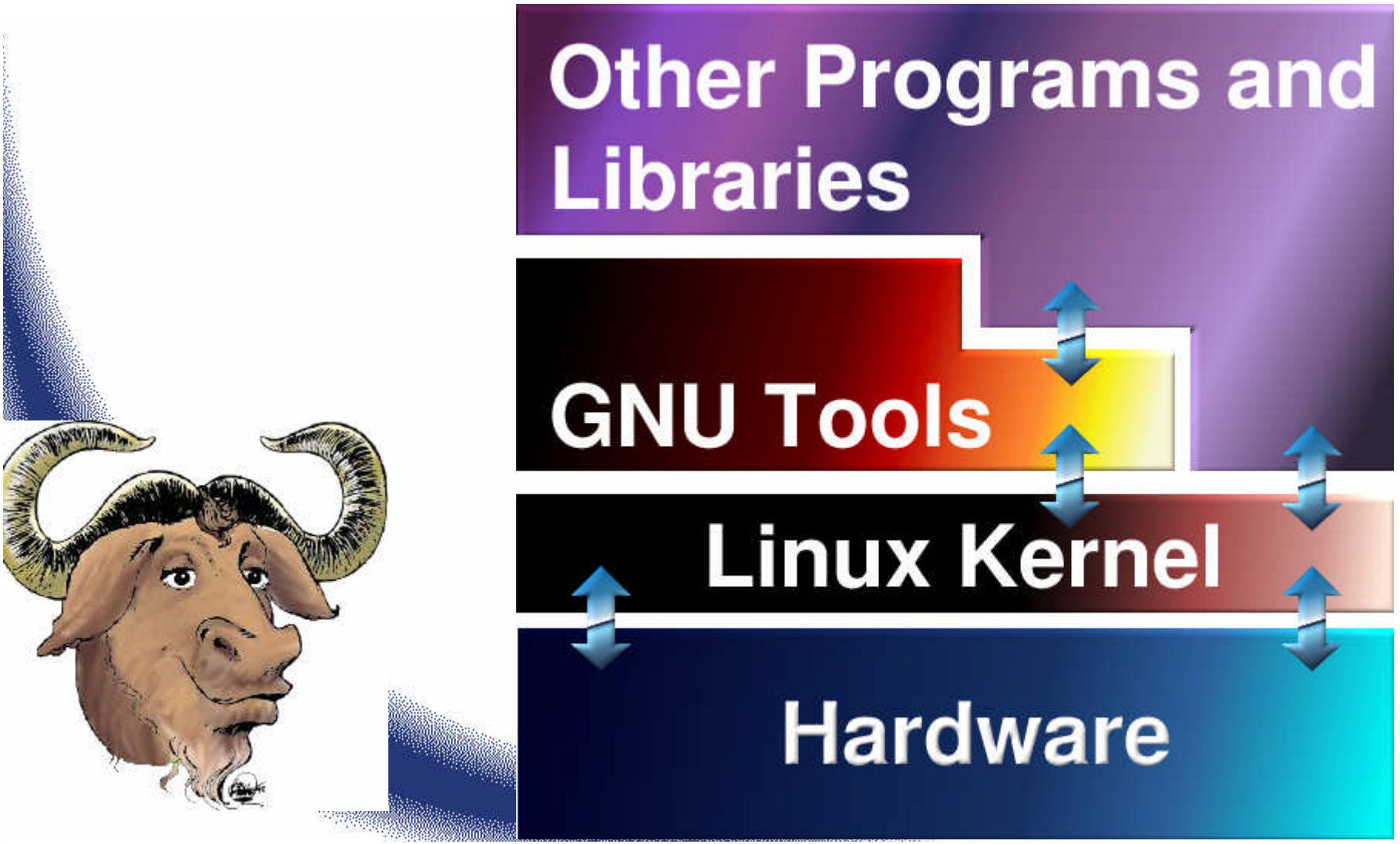
Linux - To Boldly Go Where No Penguin Has Gone Before

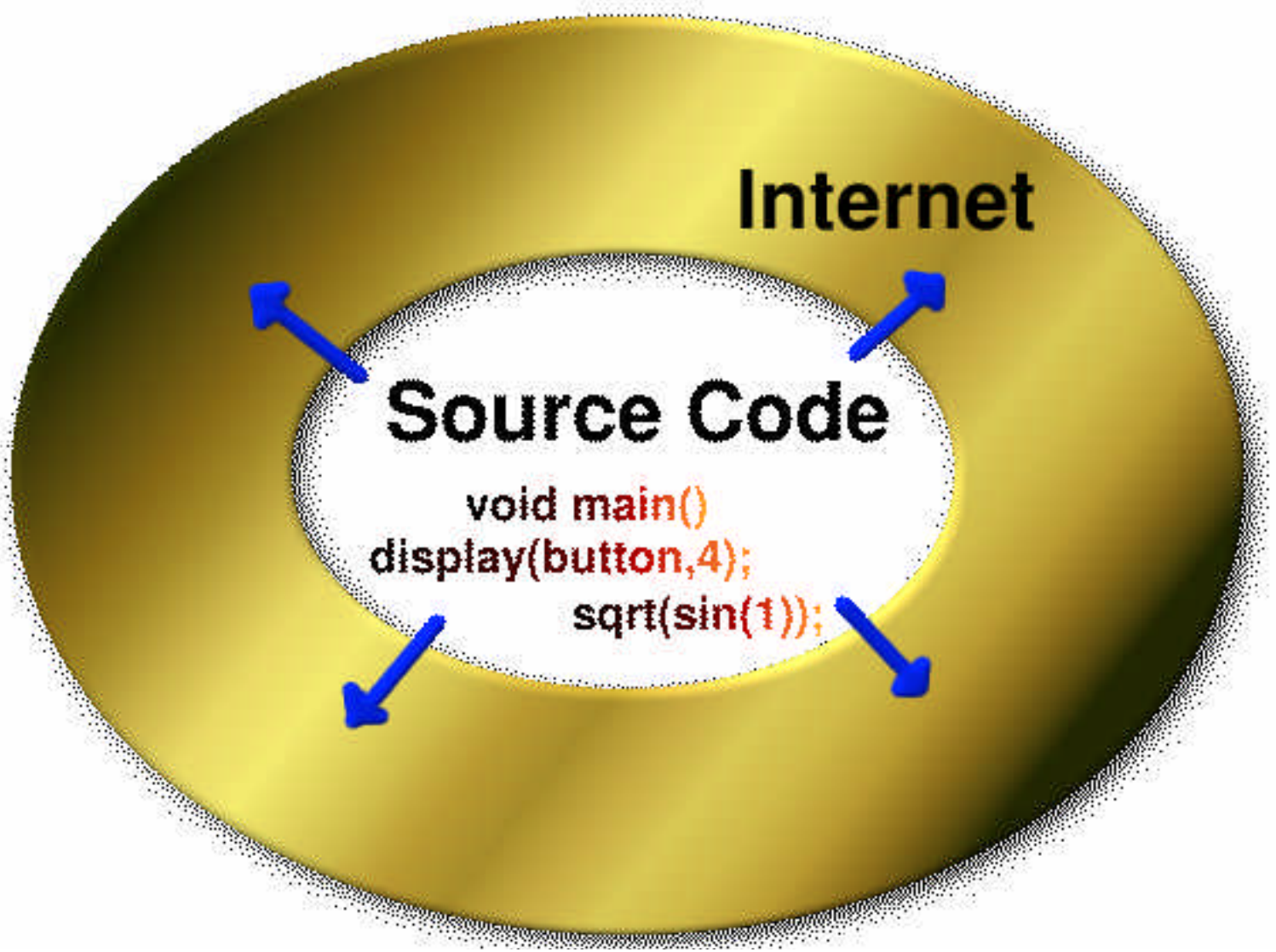
Linux History

- Linus Torvalds released first kernel in 1991
- First released under GNU Public License (GPL) with version 0.02
- Progressed to version 1.0 in 1994
- Development took off with volunteers and companies collaborating over the internet

GNU/Linux


Other Programs and Libraries
GNU Tools
Linux Kernel
Hardware

Open Source



Source Code

```
static int get_pid(unsigned long flags)
{
static int next_safe = PID_MAX;
struct task_struct *p;

if (flags & CLONE_PID)
return current->pid;

spin_lock(&lastpid_lock);
if((++last_pid) & 0xffff8000) {
last_pid = 300;
goto inside;
}
if(last_pid >= next_safe) {
inside:
next_safe = PID_MAX;
read_lock(&tasklist_lock);
repeat:
for_each_task(p) {
```

Distributions

(Tens more than just those listed here.)

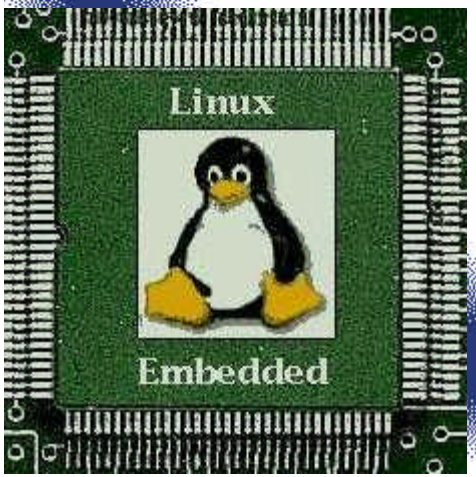
Linux Systems

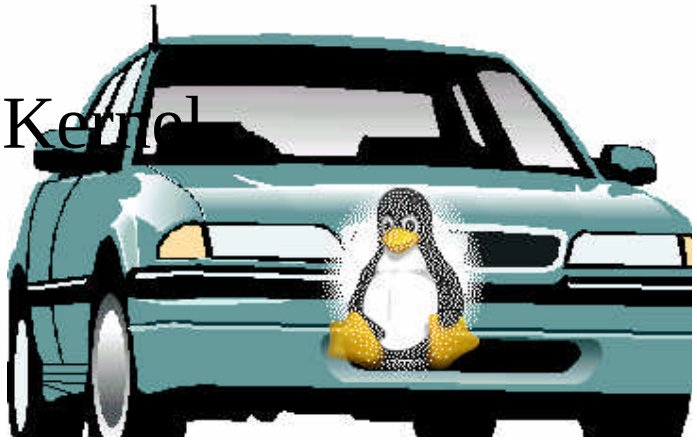
Alpha
ARM
Beowulf Clusters
Itanium
Intel Compatible 386 and Above
MIPS and MIPS 64
PowerPC
S/390
Sparc and Sparc 64

Kernel Requires a Minimum of 2 Megabytes of RAM,
but other programs may require more

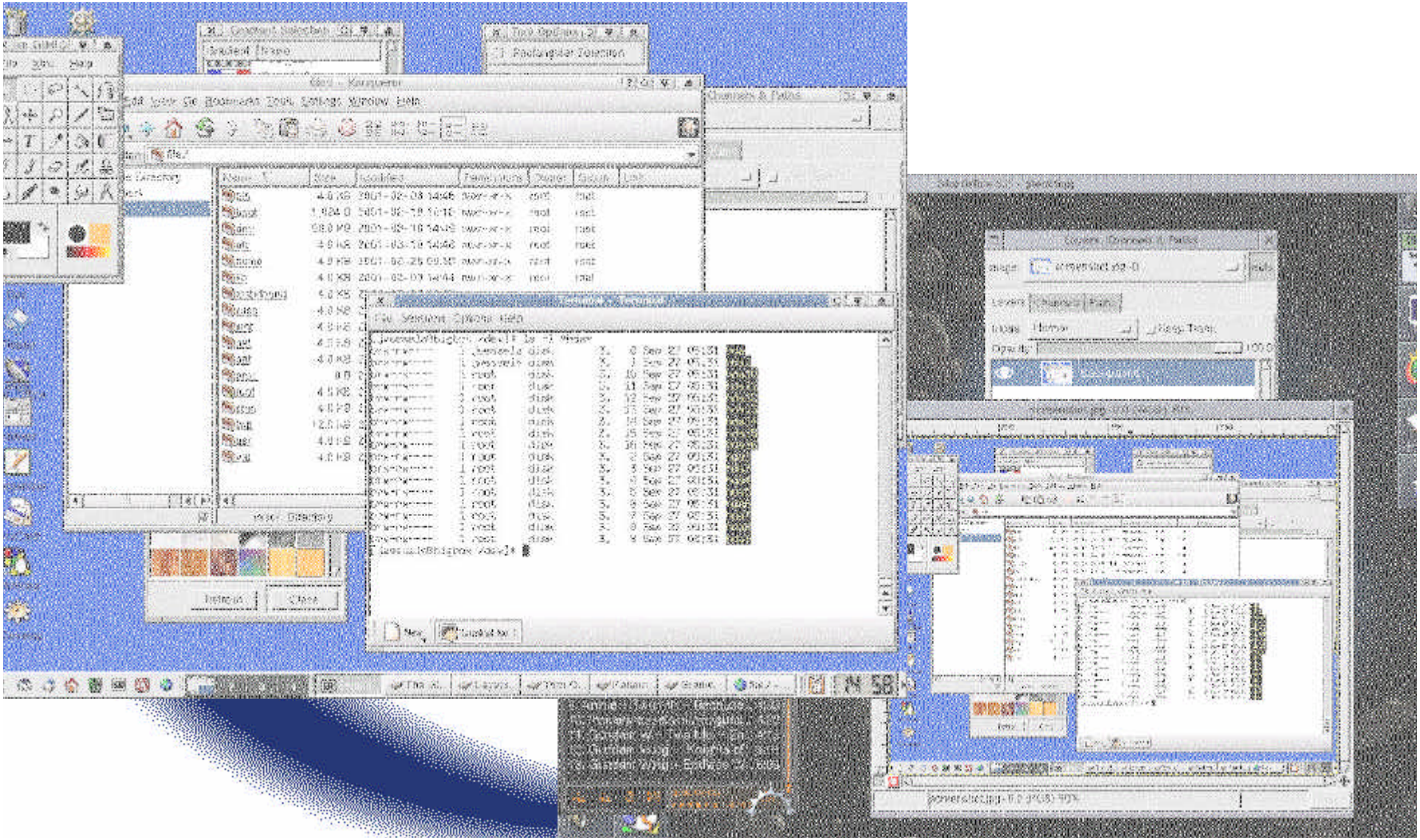
Embedded

- 100% Reliability
- Small Size
- Little (if any) Interaction
- Customizability
- Real Time Versions of Kernel





Short Demo



2.4 Kernel

- Released on January 5, 2001 after more than two years of development
- Addresses many performance and scalability problems present in the 2.2 kernel
- Although it includes enhancements across the board, this version of the kernel is aimed at the enterprise

Enhancements

- Logical Volume Manager
- Raw Device I/O, without caching
- Number of simultaneous processes increased
- Large memory and terabyte-sized files
- Improved multiprocessor support
- Specialty and journaling file systems added
- Restructuring of kernel source code
- Devfs and khttpd

What 2.4 Means

- Moves Linux from the small server to larger systems
- Expands capabilities to the data center
- Source code restructuring makes it easier for outside developers to understand kernel better, and drop unneeded parts with fewer changes
- ɔares Linux for faster adoption on the ɪtop

Kernel Moves On

- Source always available, even in development versions
- 2.5 kernel will include more hardware support, and further section rewrites (SCSI area in particular) are planned
- Current stable version passed on, Linus begins working on unstable version

Strengths

- Specialty purposes
- Customizability
- Number crunching on a grand scale
- [illegible]ty
- [illegible]source

Specialty Servers

- Firewalls and VPN gateways
- IRC, WWW, FTP, DNS, DHCP serving
- Network traffic shaping
- File serving in heterogeneous networks
- Media streaming
- Backup storage systems
- Database server

Super Clusters

- Number intensive parallel computing
- Used for scientific research and video scene rendering - problems that can be broken up
- (Relatively) Cheap super computers

Customizable

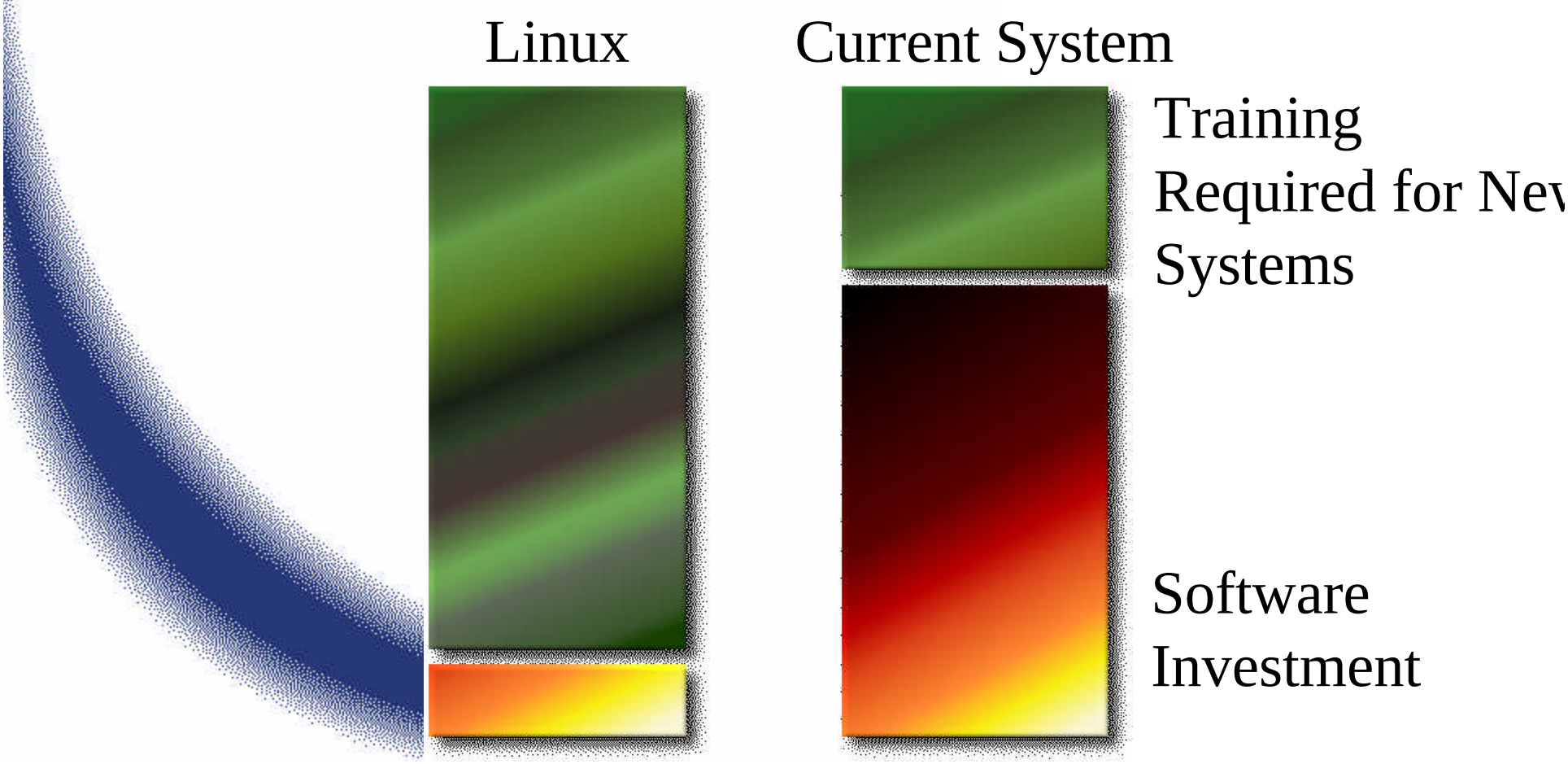
- A Linux distribution is made of different parts which come from several vendors, so it is simple to replace/remove them
- Source code to the different programs are often released under the GPL/BSD licenses, allowing you to modify the internals
- Linux was originally meant for the power user and administrator, so access to the underlying power is straightforward

Shortcomings

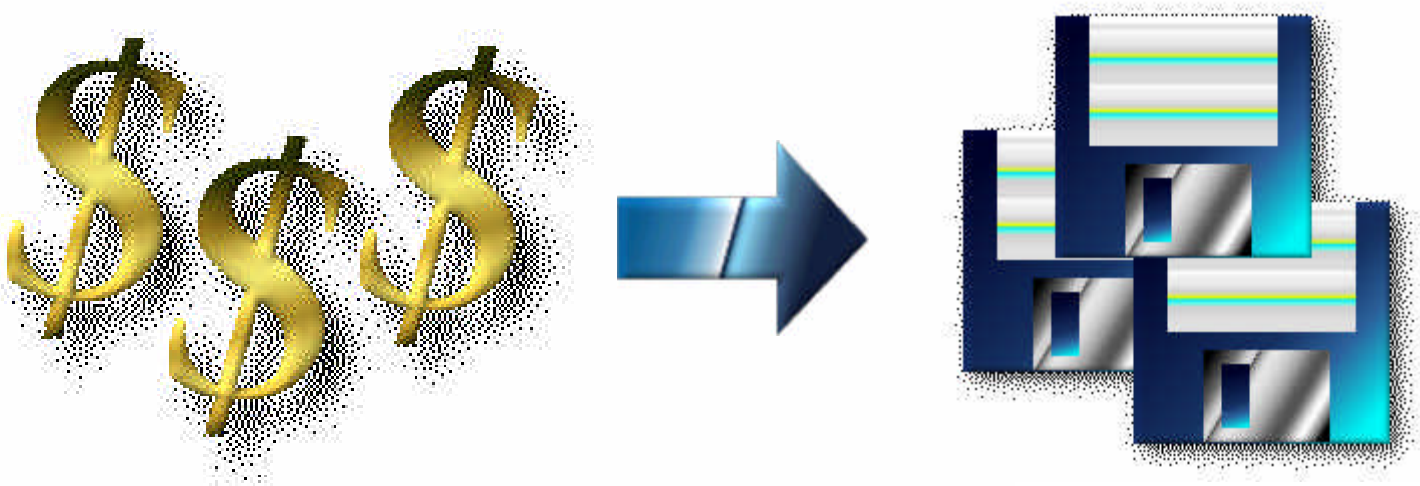
- Training staff to use a new system increases expected deployment costs considerably
- Commercial applications on the Linux platform are rare
- Proprietary data formats hinder moving existing data to open formats which are still young
- System hardware is not always supported on Linux

Training Needed

Initial Costs More Than Expected



Commericial Applications

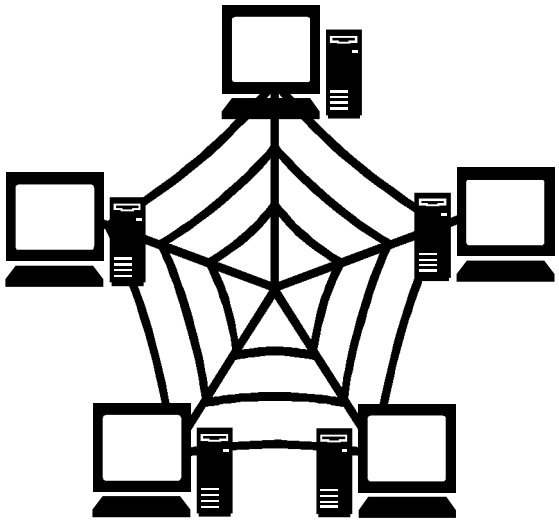


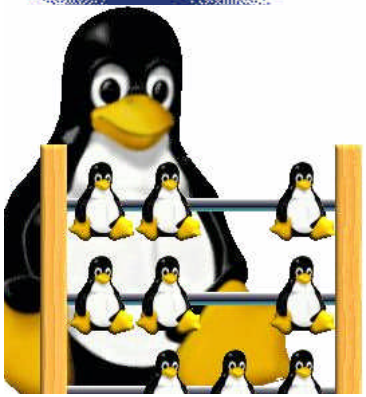
Data Conversion

```
#define UIDHASH_BITS        8
#define UIDHASH_SZ          << UIDHASH_BITS)
#define UIDHASH_MASK        UIDHASH_SZ - 1)
#define __uidhashfn(uid)    > UIDHASH_BITS) ^ uid) &
UIDHASH_MASK)
#define uidhashentry(ui     able + __uidhashfn(uid))

static kmem_cache_t
static struct user_str      ASH_SZ];
static spinlock_t u         UNLOCKED;

struct user_stru
    __count
                files:
                ATOMIC_INIT(0
```





Hardware Compatibility

- Same problem as commercial applications, hardware vendors will not support Linux until there is a demand for it
- Network support is excellent, but video, modem, sound, and printer support lacks where the open source world doesn't have access to the specifications

Q&A Session

(Stump the Speaker Session)