Unix/Linux体系及编程

2021 Spring

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课程目标

三会
1. 会使用
2. 会管理
3. 会编程（开发）
   - 应用开发（*C/C++*）
   - 内核开发（*C/C++*）
   - **Shell Prog**
   - **Python Prog**
   - **Ruby**
   - …

Actually

- 培养兴趣
- 设计思想
- 处理理念

教学计划

- 教材&参考：
  Linux **基础教程(第三版)，黄丽娜，2015**
  清华大学出版社
  UNIX操作系统教程（英文版）
  机械工业出版社
  UNIX教程（中文版）机械工业出版社

  鸟哥的Linux私房菜（第四版）

  UNIX环境高级编程，机械工业出版社

- 总学时：48

  - 讲课：30

  - 实验：16

  - 考试：2

成绩评定（**pending**）

- **Homework: 10%**
- **Experiment: 20% (16H)**
- **Exam: 70%**（闭卷）
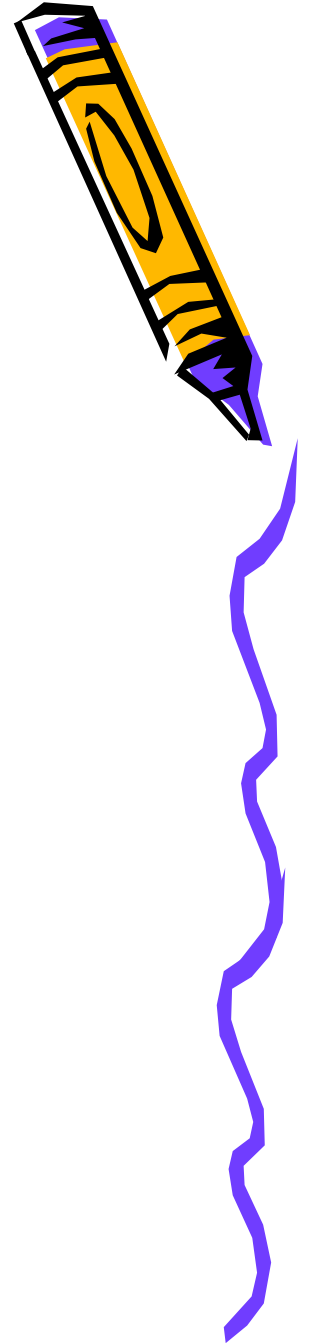
上机方式

- **IP:172.27.70.148**
  - 账号**stu****（学号后**4**位）
  - **Passwd:**同上

- 疫情网课期间:

  - **Vmware+Linux**
  - **https://www.shiyanlou.com/courses/1 (**实验楼**)**
  - **http://cb.vu/**
  - **https://www.tutorialspoint.com/unix_terminal _online.php (shell prog)**
 - **Mac terminal**

```
buyhorse@ubuntu: ~
login as: buyhorse
buyhorse@172.27.70.148's password:
Server refused to set all environment variables
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 3.13.0-85-ge

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Mon Feb 26 15:09:59 CST 20

  System load:     0.0                Processes:
  Usage of /home: 11.5% of 280.20GB   Users logged in
  Memory usage:    5%                 IP address for
  Swap usage:      0%                 IP address for

  Graph this data and manage this system at:
    https://landscape.canonical.com/

You have mail.
Last login: Mon Feb 26 09:23:16 2018 from 172.27.69.1
buyhorse@ubuntu:~$
```
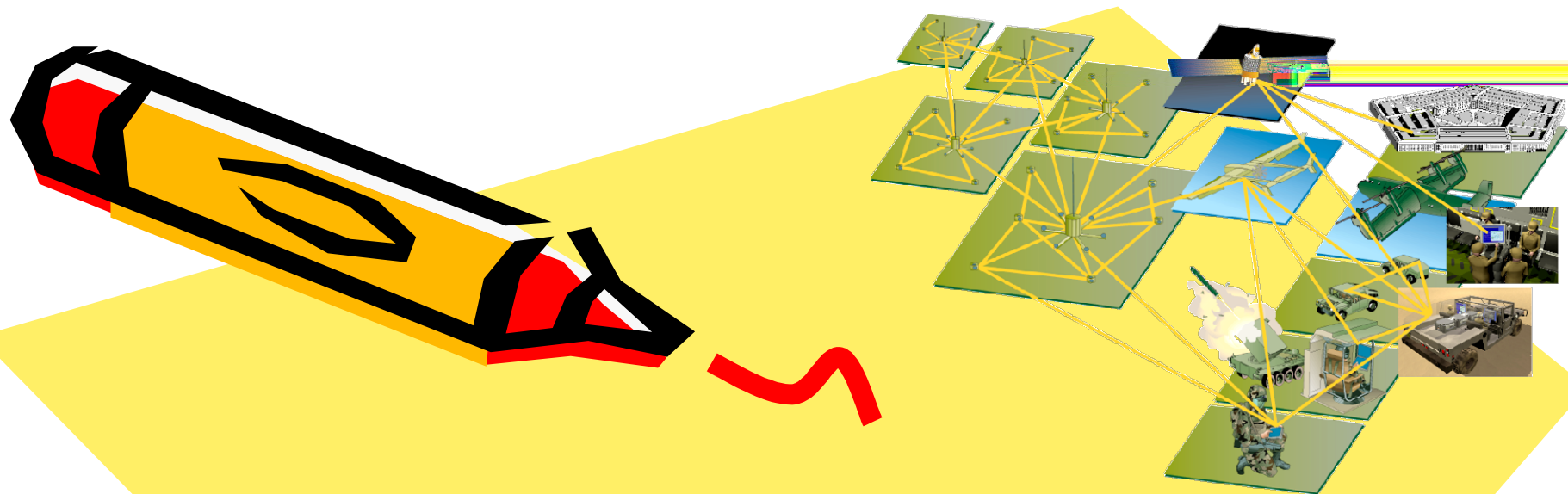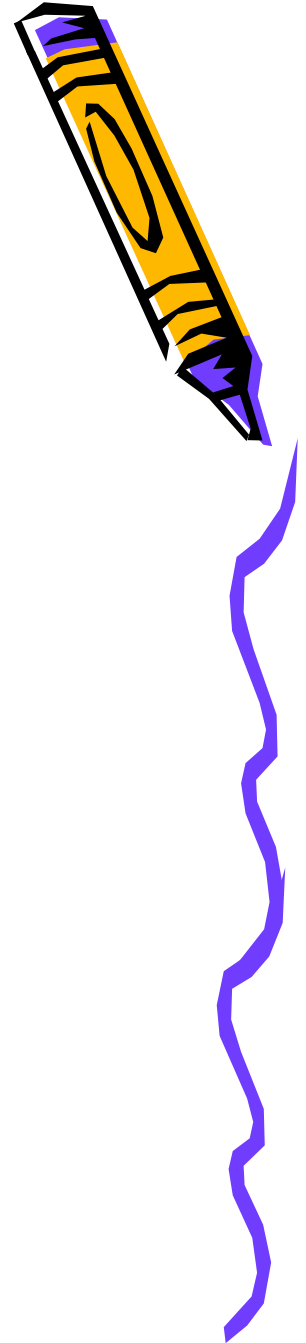
Chap1 Linux简介
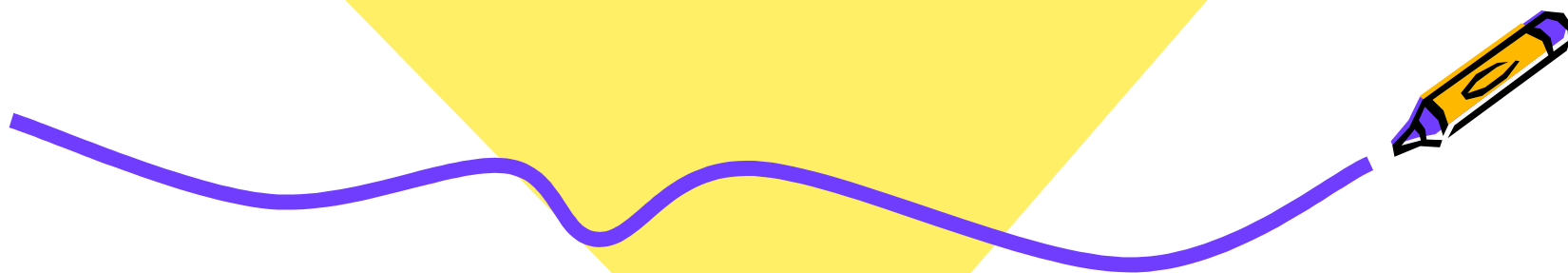
Outline

- 了解UNIX 与Linux的历史
- 明确Linux的特点与优点
- 掌握Linux的结构
- 了解Linux的发布版本
- 明确Linux 的新特点
- 明确Linux的发展方向与发展趋势

软件私有的问题

1. 限制了软件的使用人数。假设一个软件已经开发出来，那么这个软件的所有投资都已经付出（无论有多少人使用它），从社会的角度来看，任何限制软件使用的行为都是对其投资的浪费。

2. 破坏了社会和谐。假如你和你的邻居都想使用同一个软件，你购买了这个软件，你的邻居向你借，那你就会陷入两难的境地。如果借，那么你违反了版权法，如果不借，你就违背邻里互助的美德。

3. 不允许用户修改代码。这导致了用户无法根据自己的需求重写软件。如果一个现有的软件不能满足需求（很可能只要在原有的修改少量代码即可），用户要么自己重新写一个软件，要么就忍受现有软件的不完美。

4. 不利于软件的开发。我们无法获得原代码（因为这属于商业机密），所以我们每个人都无法借鉴现有的软件开发经验，至多我们只能站在周围人的肩膀上。

·Free Software！

Unix History

- Unix 1969，Ken Thompson、Dennis Ritchie began on PDP-7(DEC), then to Unix. "UNIX"（UNICS, Uniplexed Information&Computering Service) ,BELL LABS, AT&T

- 1973, Rewritten in C. This made it portable and changed the history of OS

- 1974: Thompson, Joy, Haley and students at Berkeley develop the BSD of UNIX

- two main directions emerge:
  - BSD (Berkeley Software Distribution)
  - what was to become "System V"

- Keep it simple & stupid

- http://www.unix.org/what_is_unix/history_timeline

2021/4/14

UNIX family tree

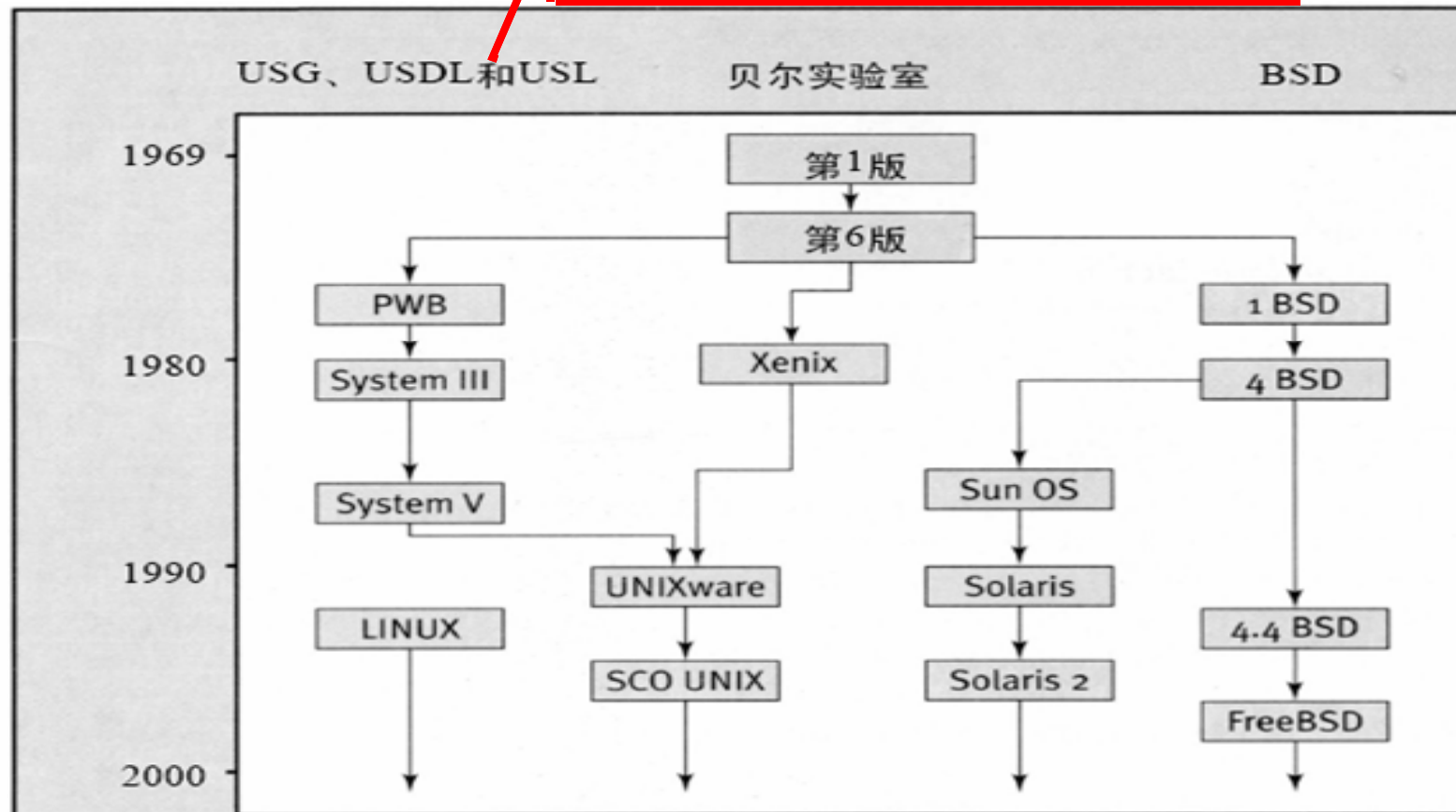- **UNIX Support Group**
- **UNIX System Development Laboratory**
- **UNIX System Laboratory**

USG、USDL和USL　　　　贝尔实验室　　　　BSD

| 1969 | 第1版 |
| 第6版 |

PWB　　　Xenix　　　1 BSD

1980　System III　　　　　4 BSD

System V　　　Sun OS

1990　UNIXware　Solaris　4.4 BSD

LINUX　SCO UNIX　Solaris 2　FreeBSD

2000

图2-1　UNIX谱系略图

THE

C

ANSI C

PROGRAMMING
LANGUAGE

BRIAN W. KERNIGHAN
DENNIS M. RITCHIE

PRENTICE HALL SOFTWARE SERIES

1.1 Unix与Linux

- Linux vs. UNIX
- Minix (Andrew Tannebaum)
- Linus Torvald (University of Helsinki, 1991)
- Distribution version vs. Kernel version
- Red hat & Ubuntu ≠Linux

1.1 Unix与Linux

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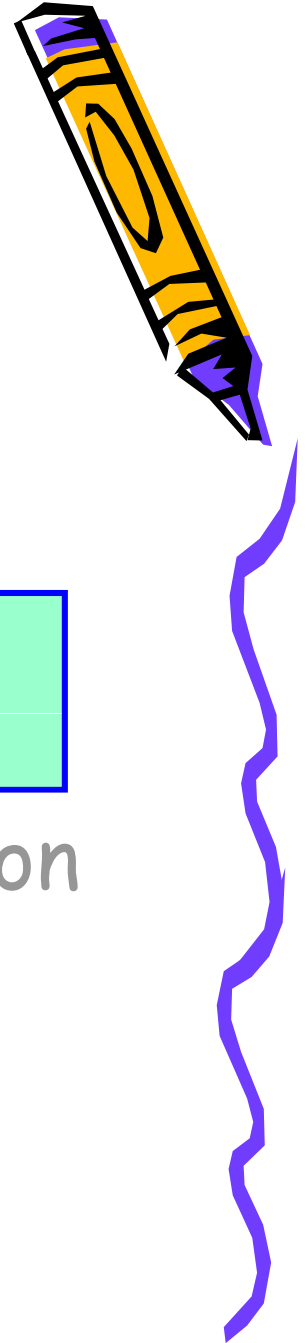- Red h

  - Andrew Tannebaum
  - Minix 3
  - www.minix3.org
  - microkernel(WindowNT,Minix,Mac)

1.1 Unix与Linux

- Linux vs. UNIX
- Minix
- Linux: Linus Torvald (University of Helsinki, 1991)
- Distribution version vs. Kernel version
- Red hat & Ubuntu ≠Linux

From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Message-ID: <1991Aug25.205708.9541@klaava.Helsinki.FI>
Date: 25 Aug 91 20:57:08 GMT
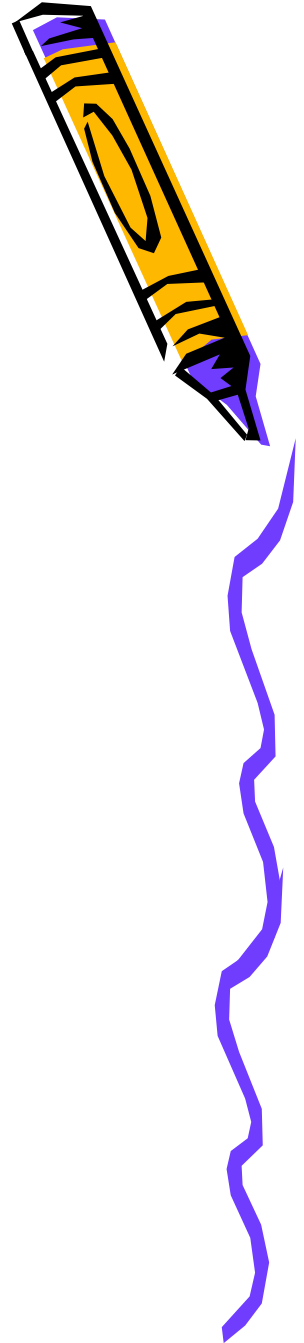*Organization: University of Helsinki*

Hello everybody out there using minix –

I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them 🙂

Linus (torvalds@kruuna.helsinki.fi)

PS. Yes – it's free of any minix code, and it has a multi-threaded fs. It is NOT protable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-(.

1.1 Unix与Linux

- Linux vs. UNIX
- Minix
- Linux: Linus Torvald (University of Helsinki, 1991)
- **Distribution Version vs. Kernel Version**
- Red Hat

- **UNIX DV: IBM AIX, BSD, MAC OS, FreeBSD, HP-UX, Linux, MINIX, NetBSD, Solaris, System V, …**
- **Linux DV: Ubuntu, RedHat, openSUSE, Fedora, Debian GNU/Linux, Slackware Linux, Gentoo Linux,…**
- **KV: 2.6.38 …**
- **uname**

Wednes

1.1 Unix与Linux

- Linux vs. UNIX
- Minix
- Linux: Linus Torvald (University of Helsinki, 1991)
- Distribution version vs. Kernel version
- **Red hat & Ubuntu ≠ Linux**
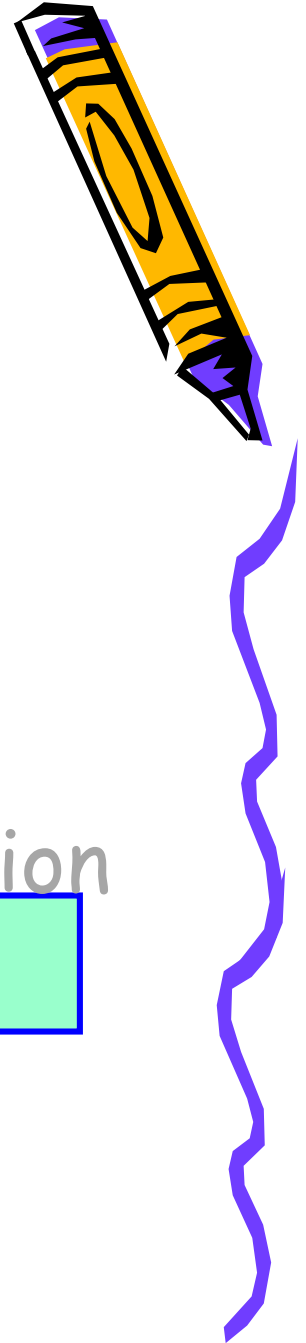
1.2 Linux的特点

- 高效性和灵活性
- 不同的Linux发行包差别有限
- Linux能够完成关键业务
- Linux更加安全可靠
- Linux花费很小
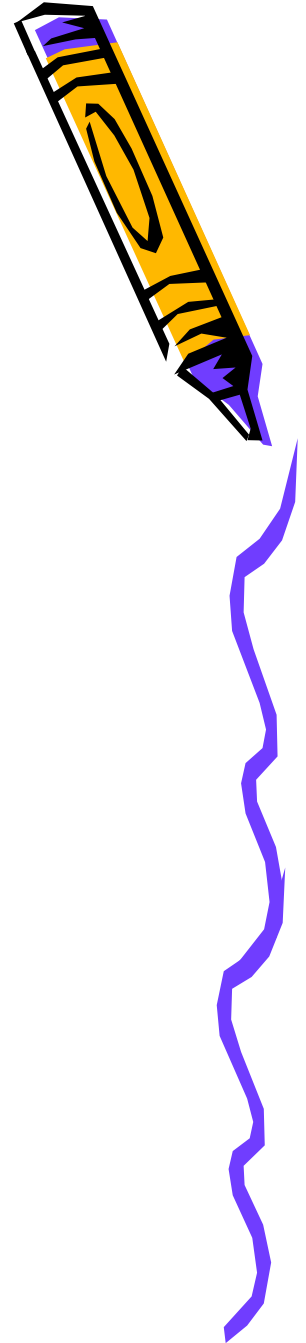
1.3 Linux的结构

- **内核（又称核心，kernel）**
  - 进程与内存管理
  - 文件管理
  - **I/O**设备管理
- **实用程序**
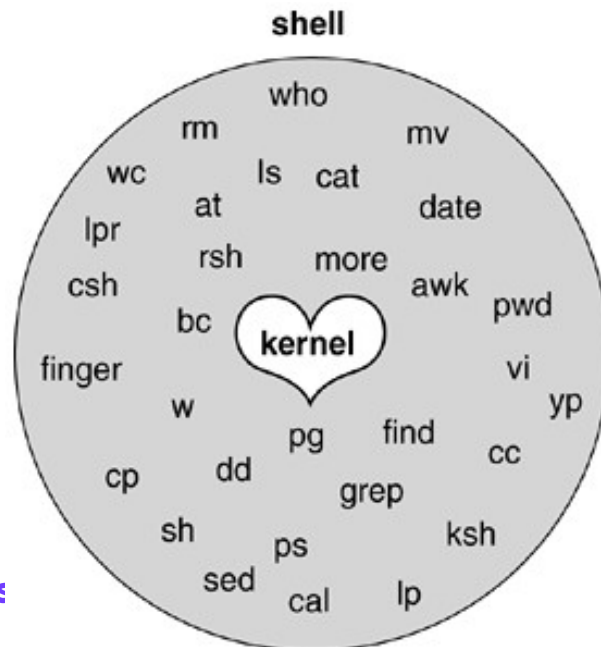 - 命令解释器**SHELL**
  - 汇编程序
  - 编译器
  - 编辑器
  - 调试器
  - …

- **SH**
- **BASH: Bourne Again SHell**
- **KSH**
- **CSH**
- **…**

What Is SHELL?

- The shell is a special program used as an interface between the user and the heart of the UNIX/Linux operating system, a program called the kernel

- ## The kernel, the shell, and you

shell

who
rm   mv
wc   ls   cat
at   date
lpr
rsh   more
csh   awk   pwd
bc   kernel
finger   vi
w   yp
pg   find
cp   dd   cc
grep
sh
ps   ksh
sed
cal   lp

% you

The Linux Shells

- $echo $SHELL
- $cat /etc/shells
- Responsibilities of the Shell

The default Bash prompt is the dollar sign ($).

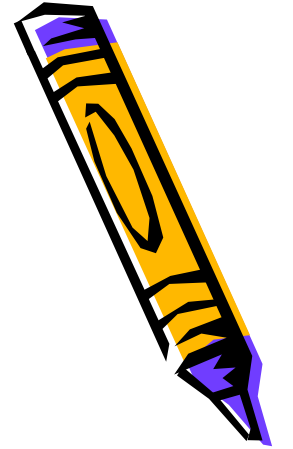# The Linux Shells

- **$echo $SHELL**
- **$cat /etc/shells**
- **Responsibilities of the Shell**

1. Reading input and parsing the command line
2. Evaluating special characters, such as wildcards and the history character
3. Setting up pipes, redirection, and background processing
4. Handling signals
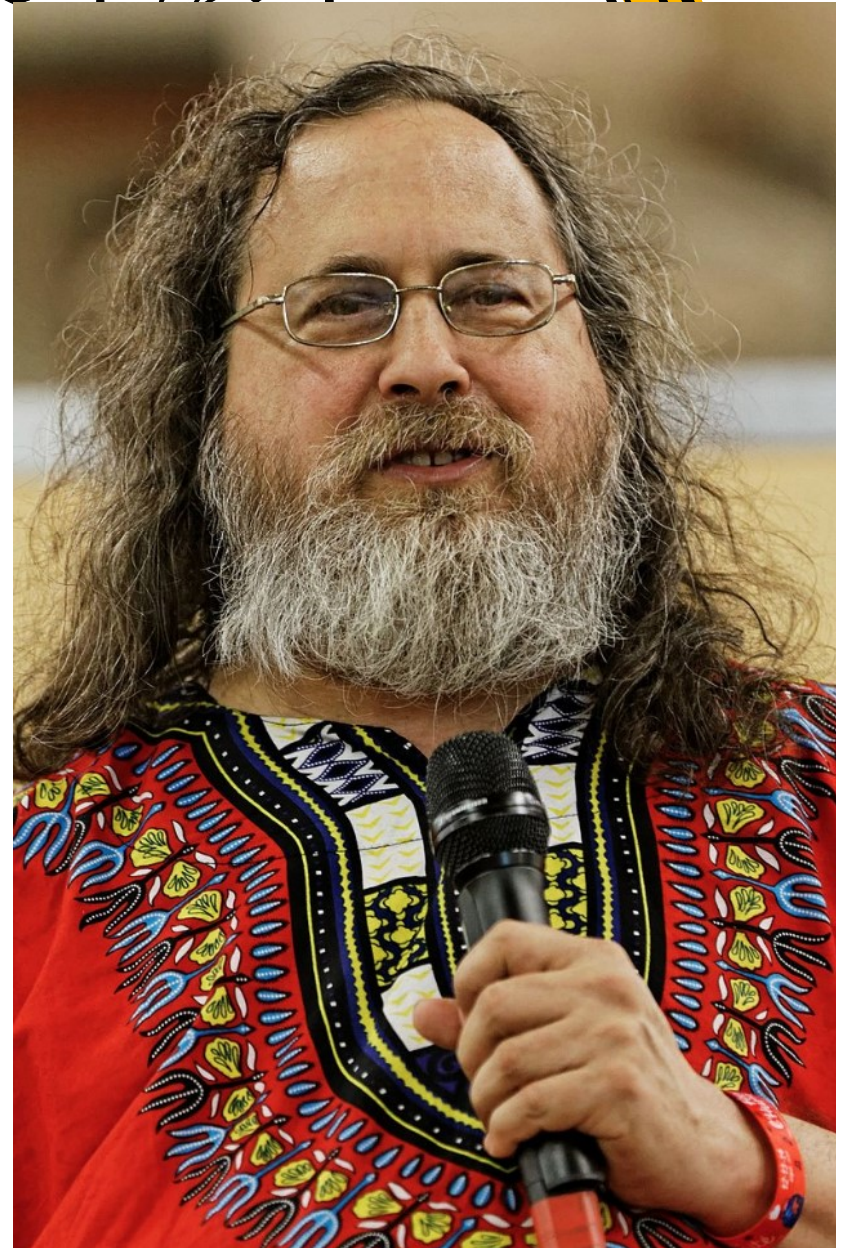5. Setting up programs for execution

1.4 Linux发布版本

- GNU/Linux Distribution

- GNU's Not Unix
- Richard Stallman, 1983/9/27
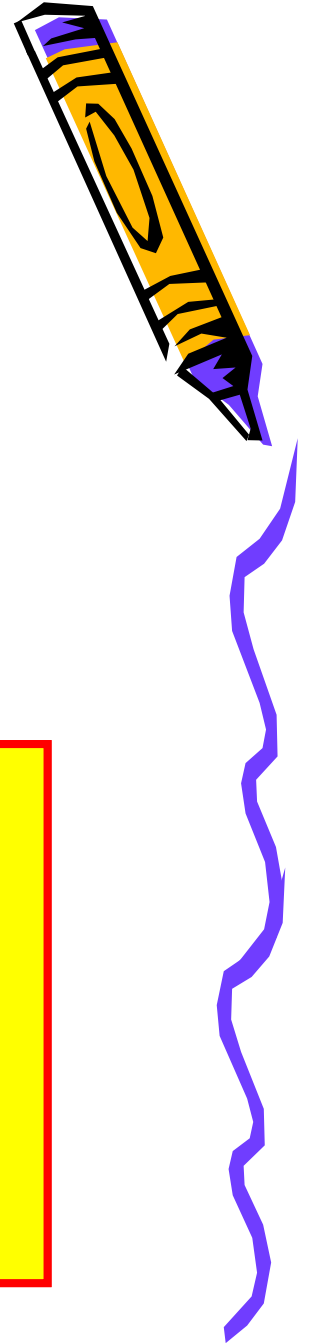- GPL: GNU General Public License
- FSF: Free Software Foundation
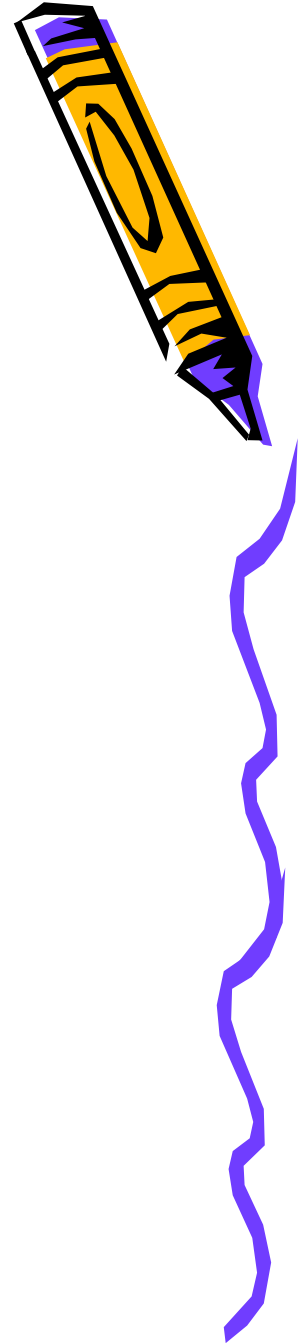
Wednesday, April 14, 2021

1.4 Linux发布版本

- GNU/Linux Distribution

  - Ubuntu
  - RedHat
  - openSUSE
  - Fedora
  - Debian GNU/Linux
  - Slackware Linux
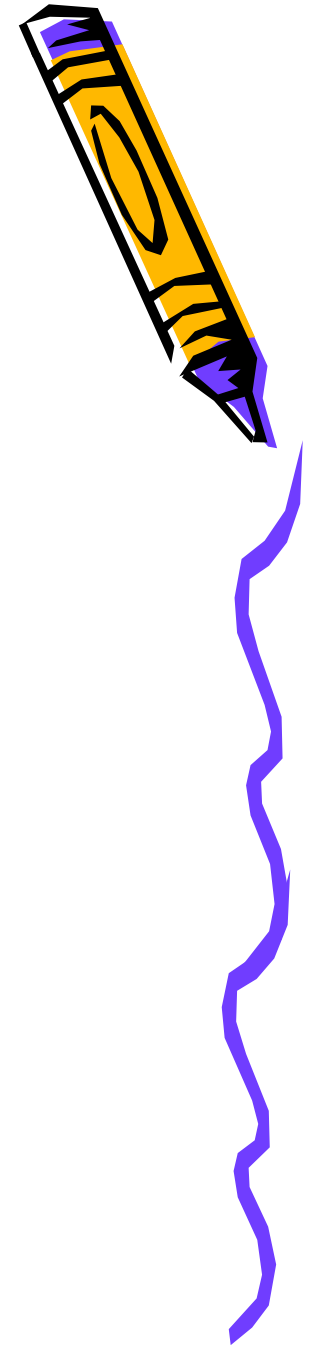 - Gentoo Linux
  - …

1.5 Linux 新特点

- 处理同步编程的新方法
- 高性能的新内核:5.x.y (https://www.kernel.org/)
- 桌面环境更丰富(XWindow)
- 易操作的图形界面
- 网络软件趋于成熟
- 管理功能齐全

1.6 Linux软件资源

- 常用软件
- 常用Linux网上资源
- 发展方向
  - 企业级技术支持
  - 更多应用程序支持
  - 标准化

1.6.3 存在问题

- 应用软件的支持
- 自由软件带来的问题——标准化

本章小结

- **Linux**相关概念
- 发展历程
- **Shell**基本概念