



# 系統程式設計 Systems Programming

鄭 卜 壬 教 授  
臺 灣 大 學 資 訊 工 程 系

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# Goal of SP Course

You are expected ....

to be familiar with the UNIX-like systems  
to become good system programmers

**Client**



**Server**



# UNIX

- **Created by Ken Thompson & Dennis Ritchie at Bell Lab in 1969 & on PDP-7.**
  - ACM Turing award winners for the design of UNIX in 1983.
  - C programming language inventor: Dennis Ritchie.
- **Supports many users running many programs at the same time, all sharing the same computer system**
- **Major Contributors:**
  - Bell Laboratories, Computer Systems Research Group (CSRG) of the University of California at Berkley (released in BSD), UNIX System Laboratories (USG/USDL/ATTIS/DSG/USO/USL), etc.





PDP-11 (1972)  
Ken (sitting) & Dennis (standing)

PDP-7

D. Ritchie and K. Thompson, 『The UNIX Time-Sharing System』, CACM Vol.17, No.7, pp.365-375, 1974



# UNIX

**UNIX System  
Laboratories  
(USG/USDL/  
ATTIS/DSG/  
USO/USL)**

Chorus

System V  
Release 2,3  
↓  
UNIX  
System V  
Release 4

**Bell Labs  
Research**

First Edition  
↓  
Sixth Edition  
Seventh Edition

XENIX

Mach  
MINIX

SUNOS  
Solaris  
Solaris 2

**Berkley  
Software  
Distributions**

1BSD,...,  
4.0BSD  
↓  
4.3BSD  
4.3BSD Tahoe  
4.3BSD Reno  
4.4BSD Lite

\* POSIX.1 (IEEE, ISO) standard!



- **Required Text Book**

- “Advanced Programming in the Unix Environment”  
by W. Richard Stevens and Stephen A Rago, Addison-Wesley, 3rd Edition, 2013. (source code: <http://www.apuebook.com>)

- **Reference Book:**

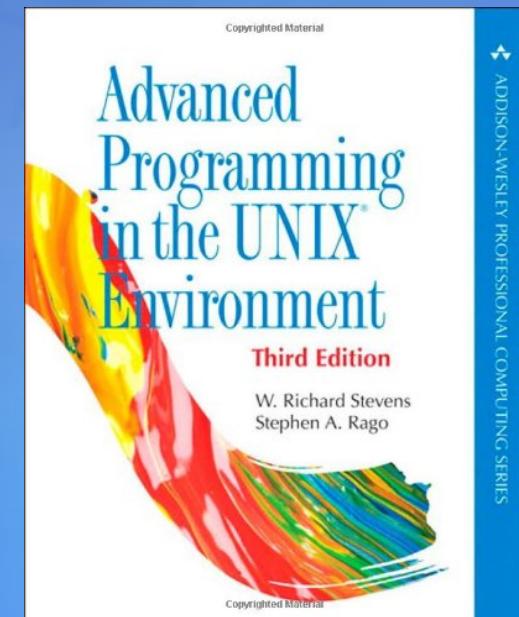
- “Understanding UNIX/LINUX Programming: A Guide to Theory and Practice” by Bruce Molay, Prentice Hall, 2002.
- “The Art of UNIX Programming” by Eric S. Raymond.  
<http://www.faqs.org/docs/artu/>

- **Prerequisites:**

- Basic C/C++ programming skill

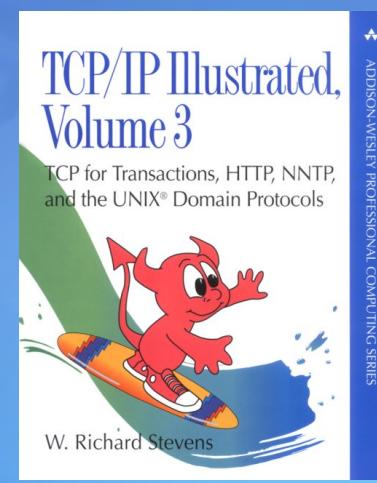
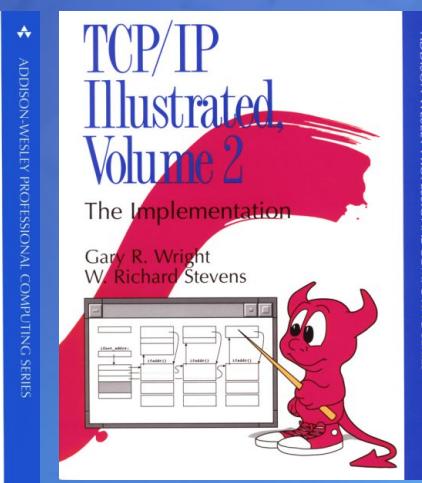
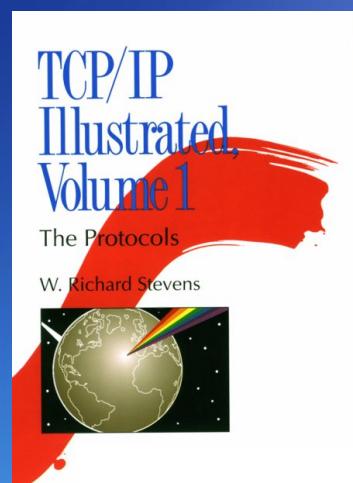
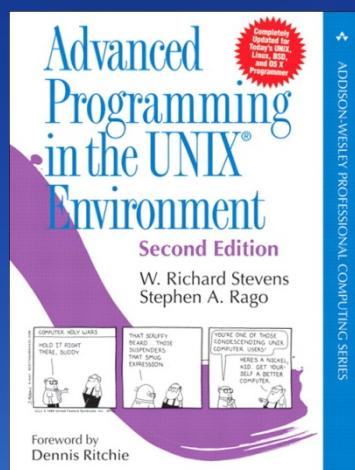
- **Getting started with UNIX:**

- A material from Stanford (<http://tiny.cc/r39hc>)  
Compile, link & debug program, gcc, make,  
gdb, shell commands



# W. Richard Stevens (1951~1999)

Ph.D. (Systems Engineering), Univ. of Arizona, 1982  
<http://www.kohala.com/start/>  
[http://en.wikipedia.org/wiki/W.\\_Richard\\_Stevens](http://en.wikipedia.org/wiki/W._Richard_Stevens)



# Administration Misc.

- **Class slides & assignment specifications**  
<http://www.csie.ntu.edu.tw/~pjcheng/course/sp2019>
- **Assignment submission & grades**  
<https://ceiba.ntu.edu.tw/1081CSIESP/>
- **Office hours**  
R323, 9:00~12:00, Friday
- **Forum for reference**  
ptt2: **SysProgram** board



# Topics to be Covered

- Basic OS Preface/Introduction
- File I/O
- Standard I/O Library
- Files and Directories
- System Data Files and Information (optional)
- Environment of a Unix Process
- Process Control & Relationships
- Signals
- Inter-process Communication
- Thread Programming
- Network Programming



# Grading Criteria

- **Mid-term exam: 30%**
- **Final exam: 30%**
- **Several hand-written exercises: 8%**
- 4 programming assignments: 32%**
  - Not allow to deliver hand-written exercises late
  - Late for programming assignments:  
-10% for each day delay
  - Plagiarism: no credit

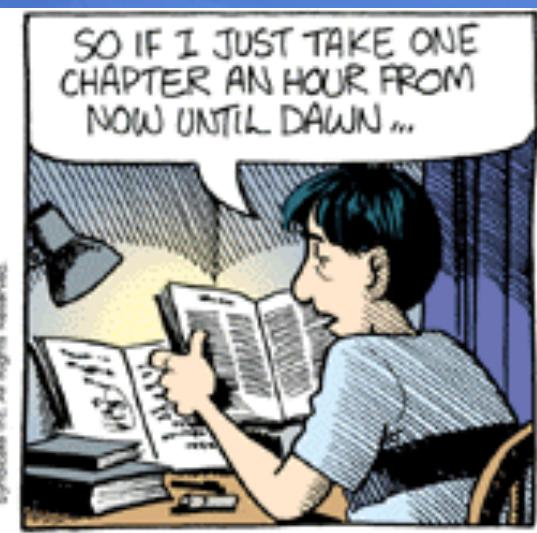


# Relation to Other CS Courses

- **Prescribed courses**
  - Programming language
    - Introduction to computer programming
    - Data structures and algorithms
    - Systems programming (this course)
  - System
    - Operating systems, computer network
- **Advanced courses**
  - Cloud computing, large-scale information system, embedded system...



# It's important to schedule your time wisely



# Enjoy & Have Fun!



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