Computer System Administration

國立成功大學資訊工程系
Department of Computer Science and Information Engineering, NCKU

Reference: NYCU CSCC SA Course

計算機系統管理這門課值得修嗎?

計算機系統管理是一門相當重要的課程，特別是對於想要從事計算機相關職業的人來說。以下是我個人的幾點觀點，供您參考：

1. 系統管理是相當實用的技能：系統管理是指對計算機系統進行維護、管理和監控的過程。在現今的資訊化社會中，幾乎所有的企業和組織都需要有人來負責系統管理。因此，學習系統管理是相當實用的技能，可以增加你在職場上的競爭力。
2. 系統管理是相當廣泛的領域：系統管理涉及許多不同的領域，包括硬體、軟體、網路、安全等等。因此，學習系統管理可以幫助你了解這些不同領域的相互作用和關聯，從而更好地瞭解計算機系統的運作原理。
3. 系統管理可以幫助你解決問題：當計算機系統出現問題時，系統管理人員需要能夠快速且有效地解決問題。學習系統管理可以幫助你瞭解常見的系統問題，以及如何解決這些問題。

總體而言，我認為計算機系統管理是一門非常值得學習的課程。如果你有興趣從事計算機相關職業，或者想更深入地瞭解計算機系統的運作原理，那麼學習系統管理會是一個不錯的選擇。

What System Administrator Should do?

- Ordinary list
  - Installing new system, programs and OS updates
  - Monitoring system and tuning performance
  - Adding and removing users
  - Adding and removing hardware
  - Backup and restore
  - Configuration management (Ansible, Chef, Puppet, SaltStack, …)
  - Infrastructure management (Terraform, …)

What System Administrator Should do?

- Ordinary list
  - Continuous Integration & Delivery (Jenkins, Travis CI, …)
  - Log management (Fluentd, Papertrail, …)
  - Security monitoring and reaction
  - Virtualization (VMWare, Xen, Bhyve, …)
  - Containerization (Docker, …)
  - Capacity planning
  - …

What System Administrator Should do?

- Non-technique list
  - Helping users
  - Maintaining documentation
  - Moving furniture
  - Good communication and memorization
    - Leverage external memory
  - ~~Burning your liver~~

What System Administrator Should do?

- The best words to describe the job
  - Thankless job.
    - https://sysadminday.com/
  - System administration is like keeping the trains on time; no one notices it except when they're late.
  - When we do right, no one remembers; when we do wrong, no one forgets.

Two videos celebrating SysAdmin Day

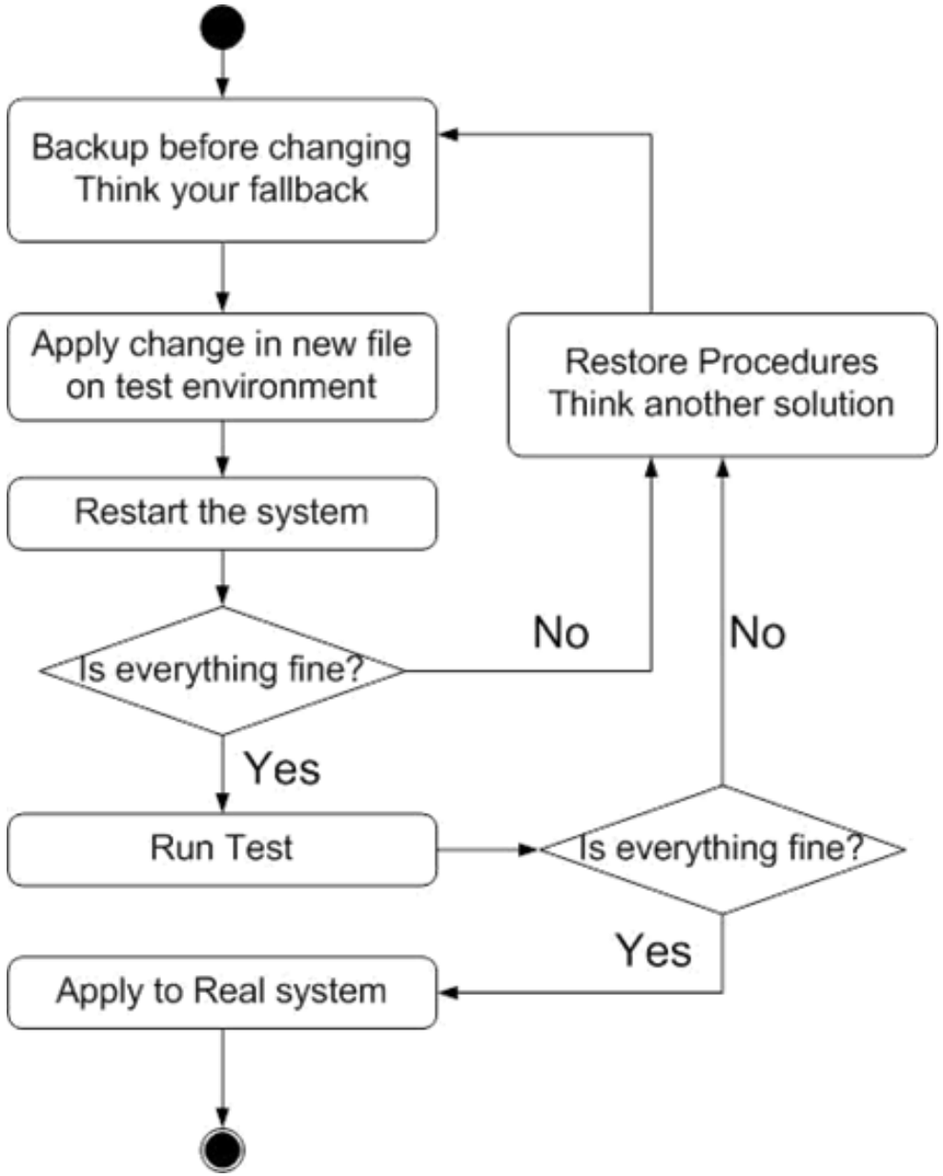
- Sysadrella (2019)
- This AI can do ANYTHING (2022)

What System Administrator Must do?

- Philosophy of system administration
  - Know how things really work.
  - Plan it before you do it.
  - Make it revertible.
  - Make changes incrementally and backward-compatible.
  - Test thoroughly before unleash it.

What System Administrator Should do?

- Flow of Change



What System Administrator Should do?

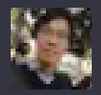
- The skills to be a candidate of system administrator
  - We are not going to teach you cool & new things
  - But the how to master these skills
  - Find and read authoritative docs, not just copy & paste from an arbitrary webpage on Internet
- System Administration
  - Manage one server
- Network Administration
  - Manage a network consisting of multiple servers and devices

About the Operating System

- Most of the course materials will take FreeBSD as examples
  - Homework is guaranteed to be doable under FreeBSD
- Linux?
  - Lots of distributions
  - You are still allowed to use them in homework
    - On your own risk

Why FreeBSD

- Our goal is to learn "How it works"
  - FreeBSD is simple and easy to learn the internals
  - Unified environment is good for educational purpose
- BSDs are still popular in some ways
  - Apple MacOS, iOS and many other products or services are based or heavily using BSDs
  - https://en.wikipedia.org/wiki/Darwin_(operating_system)



FreeBSD 和 Linux 哪種作業系統比較好?

FreeBSD和Linux都是非常優秀的作業系統，具有廣泛的應用領域和支持。以下是我個人的觀點：

1. 開放程度：FreeBSD和Linux都是開放源碼的作業系統，可以自由地查看、修改和分發源碼。不過，Linux的開放程度可能更高，因為它的開放性吸引了更多的開發者和社區參與，因此擁有更多的支持和社區。
2. 系統架構：FreeBSD和Linux的系統架構有所不同。FreeBSD使用Monolithic Kernel架構，所有系統功能都內建在內核中，而Linux則使用Modular Kernel架構，允許用戶按需加載和卸載不同的功能模組。這使得Linux的系統更靈活、更易於擴展。
3. 安全性：FreeBSD和Linux都非常注重安全性，並且有許多安全性特性和機制。FreeBSD通常被認為是一個更安全的作業系統，因為它具有較小的攻擊面積、預設情況下較少的服務和更好的安全性特性。但是，如果正確配置和管理，Linux也可以達到相當高的安全性水平。

總體而言，FreeBSD和Linux都是非常優秀的作業系統，具有各自的優點和特點。選擇哪一種作業系統，取決於個人需求和使用場景，以及對不同系統的了解程度和熟練度。

Attitude

- Attend every class
- Do every exercise
  - As early as possible
  - On your own
- Read book and practice at least 6 hours every week
  - Use unix-like environment
  - Recommend: more than 1.5 hours/day averagely.
- Collect information on the internet
  - The newer, the better.

Syllabus

- Instructor:
  - Meng-Hsun Tsai (蔡孟勳)
    tsaimh@csie.ncku.edu.tw
- Time:
  - [4] 5~7 (Thu. 1:10pm ~ 4:00pm)
- Place (hybrid):
  - 65405, New CSIE Building
  - WebEx link

Syllabus

- Discussion Forum
  - Discord link
  - We suggest you to join - TAs might give homework hints there
  - Ask course-related/technical questions there
  - Everyone in the group can answer
  - But DON'T post answer/configuration there directly!
    - You will be banned

Syllabus

- TAs:
  - We might have about 4 TAs.
  - Email to TAs: nasa@imslab.org
    - Also received by the lecturer
  - Office hour
    - by appointment
  - Website:
    - https://moodle.ncku.edu.tw/course/view.php?id=29155

Syllabus

- Email Policy (IMPORTANT)
  - Don't send course-related/technical questions to TAs
    - TAs won't answer you
    - Please ask them on course forum instead
  - Only ask TAs for personal/non-technical questions
    - Course registration/dropping
    - Grading
    - Office hour appointment
    - ~~Demo appointment~~

Syllabus – Text book outline

- Part I. Basic Administration
  - Chap 1 – Where to start.
  - Chap 2 – Booting and system management daemons
  - Chap 3 – Access control and rootly powers
  - Chap 4 – Process control
  - Chap 5 – The filesystem
  - Chap 6 – Software installation and management
  - Chap 7 – Script and the shell
  - Chap 8 – User management
  - Chap 9 – Cloud computing

Syllabus – Text book outline

- Part I. Basic Administration
  - Chap 10 – Logging
  - Chap 11 – Drivers and the kernel

Syllabus – Text book outline

- Section II. Networking
  - Chap 13 – TCP/IP Networking
  - Chap 19 – Web hosting
- Section III: Storage
  - Chap 20 – Storage
  - Chap 21 – Network file system
- Section IV: Operations
  - Chap 27 – Security
  - Chap 31 – Performance Analysis

Syllabus - Schedule

1. 2/16 Syllabus
2. 2/23 L1. Install FreeBSD / L2. Installing Applications (**anno. HW1**)
3. 3/2 L3. Shell
4. 3/9 L4. Shell Programming (**anno. HW2**)
5. 3/16 L5. Booting Up and Shutting Down
   L6. User Management.
6. 3/23. L7. Controlling Processes /
   L8. Periodic Processes
7. 3/30 L9. File System / L10. Service and Settings
8. 4/6 Spring Vacation (no class)
9. **4/13.** **Mid-term Exam** (Hand-written Exam)

Syllabus - Schedule

10. 4/20 L11. FTP / L12. Syslog (**anno. HW3**)
11. 4/27 L13. Disks / L14. GPT
12. 5/4 L15. Backup / L16. ZFS
13. 5/11 L17. Web / L18. FAMP (**anno. HW4**)
14. 5/18 L19. PKI
15. 5/25 L20. NFS
16. 6/1 L21. Automount / L22. Basic Firewall
17. 6/8 (Invited Talk) Security (DEVCORE)
18. **6/15** **Final Exam** (On-site Exam)

(Friendly Reminder) Withdrawn deadline: 5/12

Syllabus – Grade Policy

- Mid
  - 25%
- Final
  - 35%
- Homeworks
  - 40%
  - No Delay Submission
  - 4 homeworks

What you should prepare?

- Background knowledge
  - Basic knowledge of UNIX commands
  - Basic Programming skills
  - Basic of TCP/IP Networking
- Environment
  - Virtual Machine (Virtualbox, VMware)
  - Bare-metal Machine is also fine
- Yourself
  - Your hard study

Finally, Am I OK to take this course?

- Are you willing to devote yourself to exercise?
  - Yes! Please come
- Are you newbie in this area?
  - Yes!? It's ok, Please come
- Do you take more than 3 major courses?
  - Sometimes your may spend the whole weekend to just figure out what to do in the homework
  - Loading of this course roughly equals to 2~3 major courses
- **You will learn a lot if you study hard**

Some comments on the Internet

- **2010**

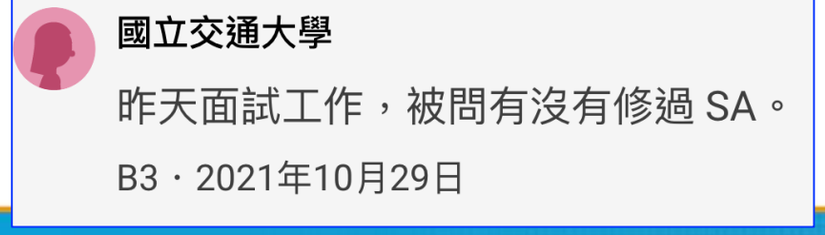
  雖然這門課的作業確實有點重，但也因為這些作業，使得 SA 比任何一門課都更能測試與磨練解決問題以及學習的能力。有心想修的同學可以透過課程網頁開始自行預習和做作業，相信一定會有不少收獲。

- **2018**

  這門課是一堂注重實務的課，只要肯認真寫作業、認真看 manual，一定可以給你滿滿的收穫。

- **2021**

  雖然早有耳聞SA 和NA是交大兩大硬課，可作業拿到手上還是被嚇到了，hw1就花了不少功夫在寫，hw2更是到了現在還有bug沒修好。整個壓力山大，加上必修課和專題，還有個最致命的GPE（對沒錯我超爛 大三還沒考過QQ）。最近期中考周整個人快要死掉，連室友都被我的氣色嚇到那種。



Basic knowledge in this course

Reference: NYCU CSCC SA Course

Usage

- SSH (Secure Shell)
  - Putty (Windows)
  - Terminal (macOS)
  - GNOME Terminal

Commands

- Useful commands
  - `ls`
  - `passwd`
  - `mkdir, rmdir`
  - `cp, mv, rm`
  - `poweroff, shutdown -p now`
  - `reboot, shutdown -r now`
  - …
- Most important command: `man`
- Basic command tutorials
  - https://it.cs.nycu.edu.tw/unix-basic-commands

Conventions in man pages

- Syntax of commands:
  - Anything between "[" and "]" is optional.
  - Anything followed by "…" can be repeated.
  - {a | b} – you should choose one of them.
    - `bork [-x] { on | off } filename...`

Yes/No	Commands
O	`bork on /etc/hosts`
O	`bork -x off /etc/hosts /etc/passwd`
X	`bork -x /etc/hosts`
X	`bork -h /etc/hosts`

Q & A

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