

# Operating System Principles

901 49000

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感謝SUNY-Stony Brook的Stoller教授，提供Nachos實習資料

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## 目的

- 介紹作業系統的基本概念、組成原理
- 透過實習，培養學生系統程式製作的基礎能力

## 對象

- 電機系、或外系同學
- 對系統程式、硬體驅動程式，有興趣研究的同學
- 想要瞭解系統程式製作的同學

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## 對學生的課前要求

- 對計算機資料結構的基本認識與能力
- 使用C/C++語言
- LINUX的使用基本知識

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很抱歉，需要調整上課時間

時段	週一	週二	週三	週四	週五	週六
上午						
下午						
晚上						

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# 基本資料

## 90149000

- 授課教授: 王凡
- 上課時間: 18:00-20:50, Thursday
- 九十九年秋季
- 教室: 博理館114
- 教科書: Silberschatz, Galvin, and Gagne,  
*Operating System Concepts*  
Version 8e, John Wiley & Sons, Inc., 2010.  
台灣代理: 新月圖書公司  
台北市重慶南路一段143號3樓  
02-2331-1578  
<http://www.bookcake.com.tw>  
newmoo@ms15.hinet.net

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## 教師聯絡方式

- 教師與課程網址:  
<http://cc.ee.ntu.edu.tw/~farn>
- 教師email:  
[farn@cc.ee.ntu.edu.tw](mailto:farn@cc.ee.ntu.edu.tw)

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# 助教資訊

吳哲榮

[b93901098@ntu.edu.tw](mailto:b93901098@ntu.edu.tw)

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[r98943100@ntu.edu.tw](mailto:r98943100@ntu.edu.tw)

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Office hours: Tuesday 1:00-2:20

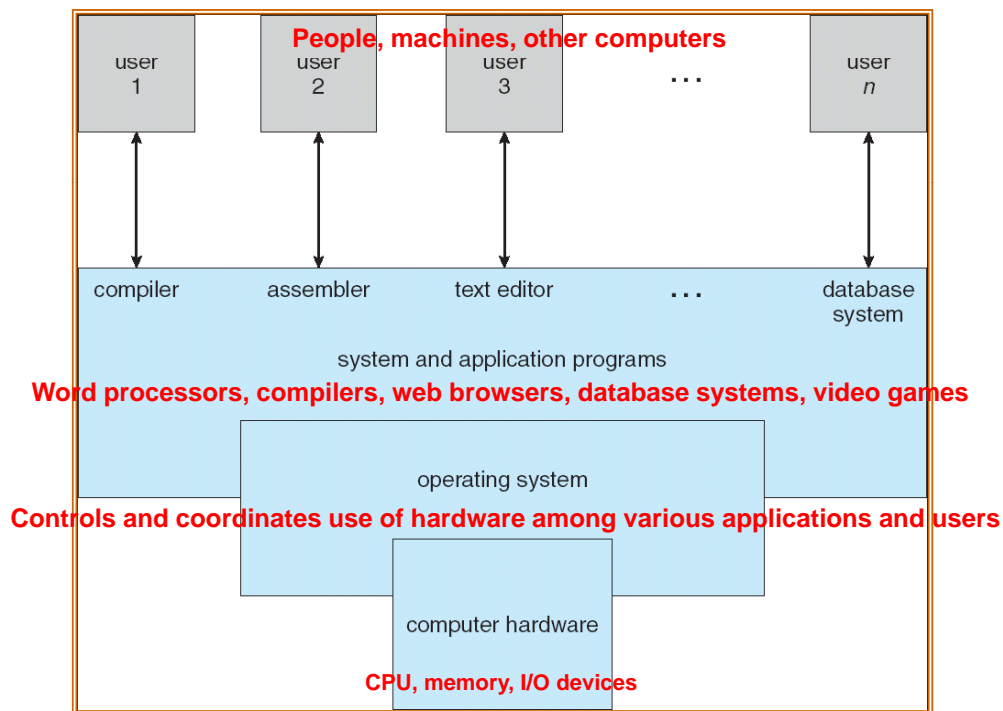
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## What is an Operating System?

- A program that acts as an intermediary between
  - a user of a computer and
  - the computer hardware.
- Operating system goals:
  - Execute user programs and make solving user problems easier.
  - Make the computer system convenient to use.
  - Use the computer hardware in an efficient manner.

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# Four Components of a Computer System



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## Functions of Operating Systems

- **Oversee operation of computer**
  - bridge between software and central hardware
- **Management of system resources**
- **Store and retrieve files**
- **Schedule programs for execution**
- **Coordinate the execution of programs**
- **Protections of system resources**
- **Security**

# Operating System Definition

- OS is a **resource allocator**
  - Manages all resources
  - Decides between conflicting requests for efficient and fair resource use
- OS is a **control program**
  - Controls execution of programs to prevent errors and improper use of the computer

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## Operating System Definition (Cont.)

- No universally accepted definition
- “Everything a vendor ships when you order an operating system” is good approximation
  - But varies wildly
- “The one program running at all times on the computer” is the **kernel**.
  - Everything else is either a system program (ships with the operating system) or an application program

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# Why do we want to learn O.S. ?

Learn

- How to program embedded systems
  - Interfaces between hardware and software
- The tremendous collections of software technology
  - Scheduling theory
  - Distributed computing
  - Storage heirarchy
  - Security systems
  - .....

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## Evolution of Modern Computer (1/7) How it started ?

Before computers:

- Who are we ?
- What is intelligence ?
- What is the mechanism of thinking ?

The secret of human intelligence  
*The source of ultimate curiosity*

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# Evolution of Modern Computer (2/7)

## How it started ?

Before computers:

- Abacus, China
- GCD algorithm, Euclid (Greece, B.C.)
- The origin of knowledge, Aristotle (Greece, B.C.)
- Philosophy of Mind (17th century)
- Computing machines (18-19th century)
- Hollerith's machine for .....

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# Evolution of Modern Computer (3/7)

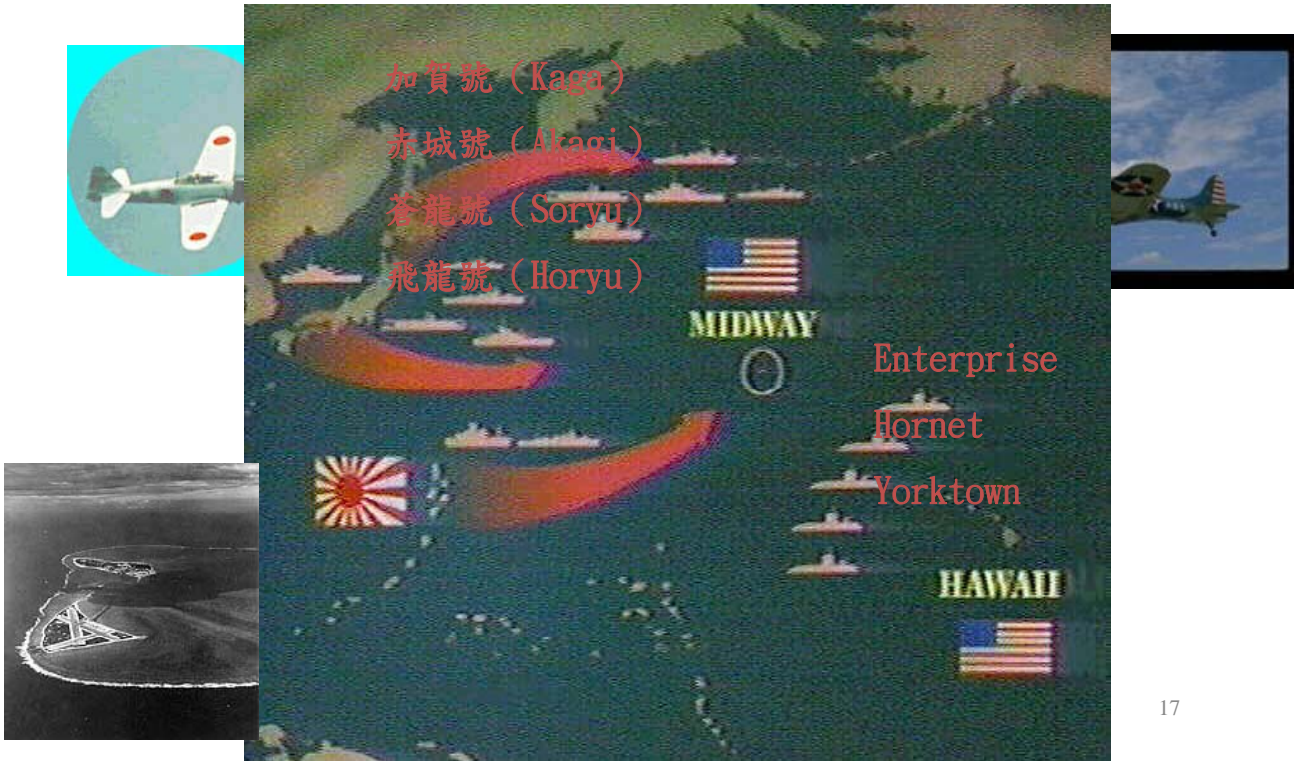
## *The War in North Africa, WWII*





# Evolution of Modern Computer (4/7)

## Battle of Midway, June 4, 1942



# Evolution of Modern Computer (5/7)

## Battle of Midway, June 4, 1942

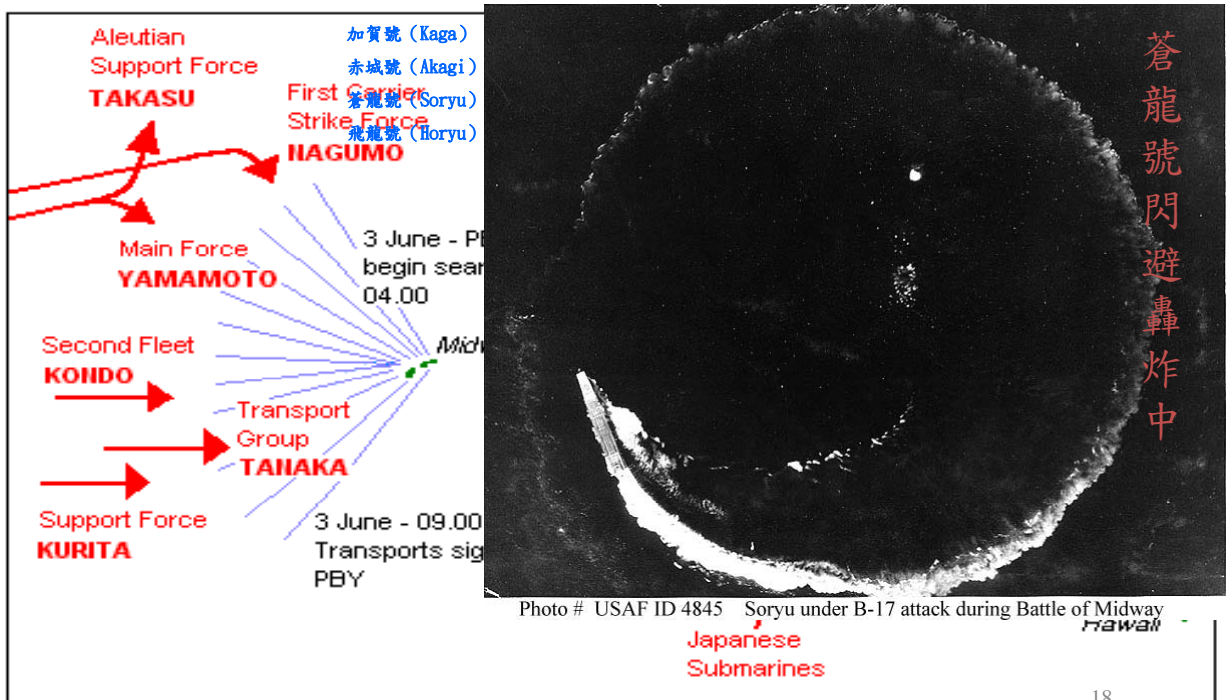


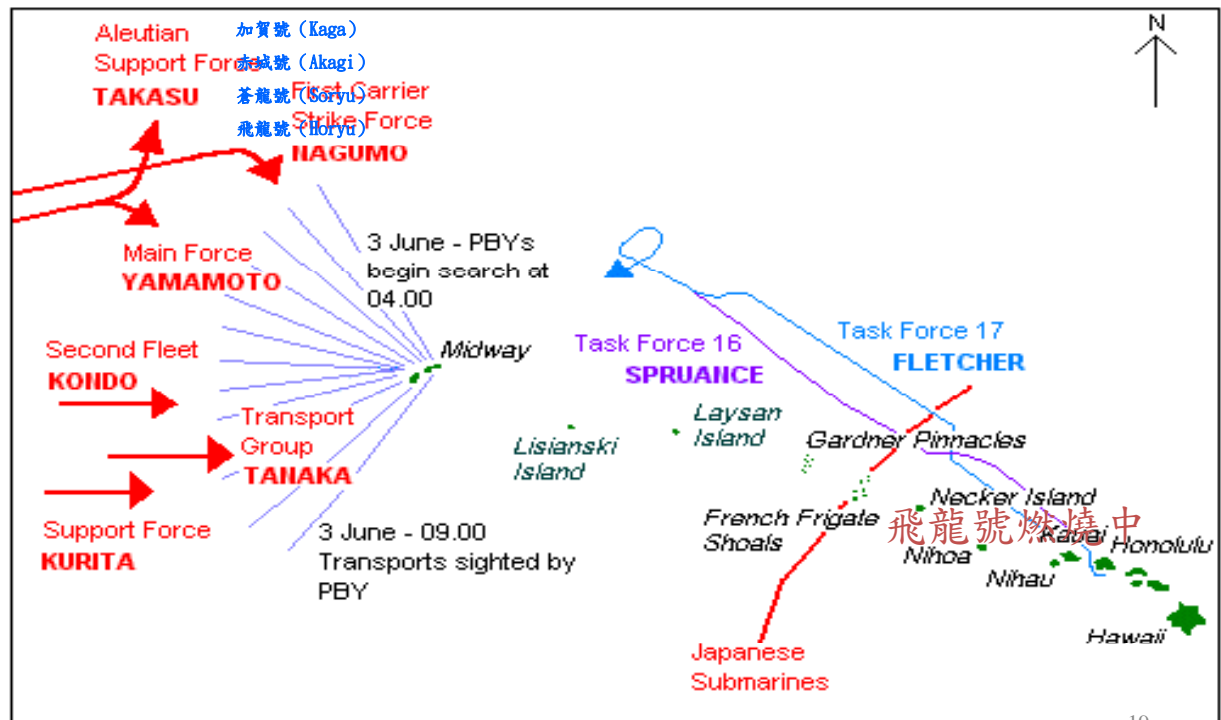
Photo # USAF ID 4845 Soryu under B-17 attack during Battle of Midway Hawaii

Japanese Submarines

The Battle for Midway, Map 1: The Fleets Approach Midway

# Evolution of Modern Computer (6/7)

## *Battle of Midway, June 4, 1942*



The Battle for Midway, Map 1: The Fleets Approach Midway

# Evolution of Modern Computer (7/7)

## *The 1st Modern Computer*

ENIAC, the first computer

- In University of Pennsylvania
- Only hardware and programs
- The computers ? Men or machines ?

# Evolution of Operating Systems (1/6)

- The period of no OS
  - operator = programmer
  - loading programs from console panel switches, cards, paper tapes
  - monitoring through display lights
  - error handling by operators
  - output to tapes or cardslater → card readers, line printers, magnetic tapes

3-21

# Evolution of Operating Systems (2/6)

- The later period of no OS
  - card readers, line printers, magnetic tapes
  - assemblers
  - loaders, linkers
  - libraries
  - device drivers
  - high-level languages: FORTRAN, COBOL, ...
    - compilers

3-22

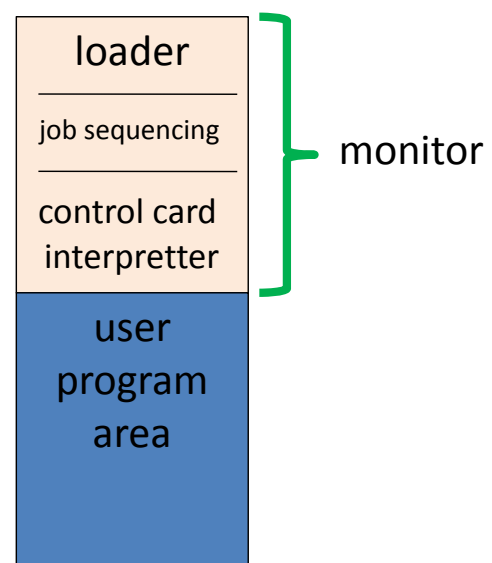
# Evolution of Operating Systems (3/6)

- Before the birth of OS
  - high-level languages: FORTRAN, COBOL, ...
    - compilers
  - human intervention → low CPU utilization
  - operator ≠ programmer
  - batch processing to share loading & setup time.

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# Evolution of Operating Systems (4/6)

- The birth of OS
  - Automatic job sequencing
  - resident monitor
  - always staying in the memory



memory allocation  
for a resident monitor

3-24

# Evolution of Operating Systems (5/6)

- Parallel I/O
  - magnetic tapes
    - sequential access
  - offline preparation of program and data to magnetic tapes
  - disks
    - random access
    - evolving to replace magnetic tapes
  - Spooling
    - simultaneous peripheral operation on-line
    - memory → disks → I/O

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# Evolution of Operating Systems (6/6)

- Shared Computing
  - Batch processing
  - Interactive processing
    - Requires real-time processing
  - Time-sharing/Multitasking
    - Implemented by Multiprogramming
  - Multiprocessor machines

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## 成績評量：(subject to changes)

- 期中考(30%)、
- 期末考(30%)、
- 作業(10%)、
- 學期Nachos計畫 (30%)

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## 非目的

- 本門課程不以當學生為目的！
    - **六十分**不能證明什麼，只能傷害你往後的申請案。
  - 可是，
    - 作業缺交多次
    - 期中考、期末考成績慘不忍睹
    - 學期計畫多次未完成、敷衍了事
- 必當!!!**

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# 學期計畫

- Nachos作業系統實習。
- 在PC Linux下執行。
- 模擬MIPS硬體架構。
- 二人一組。
- 目前暫訂三個部分：
  - Thread management
  - CPU scheduling
  - Virtual memory management

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## 預定課程進度 (I)

1. 9/17 課程簡介、第一章
2. 9/24 第二章
3. 10/1 第三章
4. 10/8 第四章
5. 10/15 第五章
6. 10/22 學期計畫介紹：Nachos簡介  
第一階段學期計畫介紹：  
*thread management*

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## 預定課程進度 (II)

- 7. 10/29 第六章
- 8. 11/5 第七章
- 9. 11/12 期中考
- 10. 11/19 第八章  
繳交第一階段學期計畫報告  
第二階段學期計畫介紹：  
*CPU scheduling*
- 11. 11/26 第九章

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## 預定課程進度 (III)

- 12. 12/3 第十章、第十一章
- 13. 12/10 第十二章、第十三章  
第二次計畫期中報告
- 14. 12/17 第十四章
- 15. 12/24 第十五章  
繳交第二階段學期計畫報告  
第三階段學期計畫介紹：  
*Virtual Memory*

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## 預定課程進度 (IV)

16. 12/31 第十六章

17. 2011/1/7

第十七章

18. 1/14 期末考

19. 1/21 繳交第三階段學期計畫報告