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Room B2.14 (CS building)

Operating Systems
COMP30640

# Introduction to COMP30640


**School of Computer Science, UCD**

**Scoil na Ríomheolaíochta, UCD**

# Who Am I?

- Anthony Ventresque
  - B2.14 (CS Building)
- MSc in Philosophy ☺ - and BSc, MSc and PhD Computer Science
- Research Areas:
  - mobile and distributed applications (in the Cloud, on smartphones),
  - applications requiring various user interactions (e.g., chatbots),
  - programs processing large quantities of data (e.g., Big Data).




# Contact Details

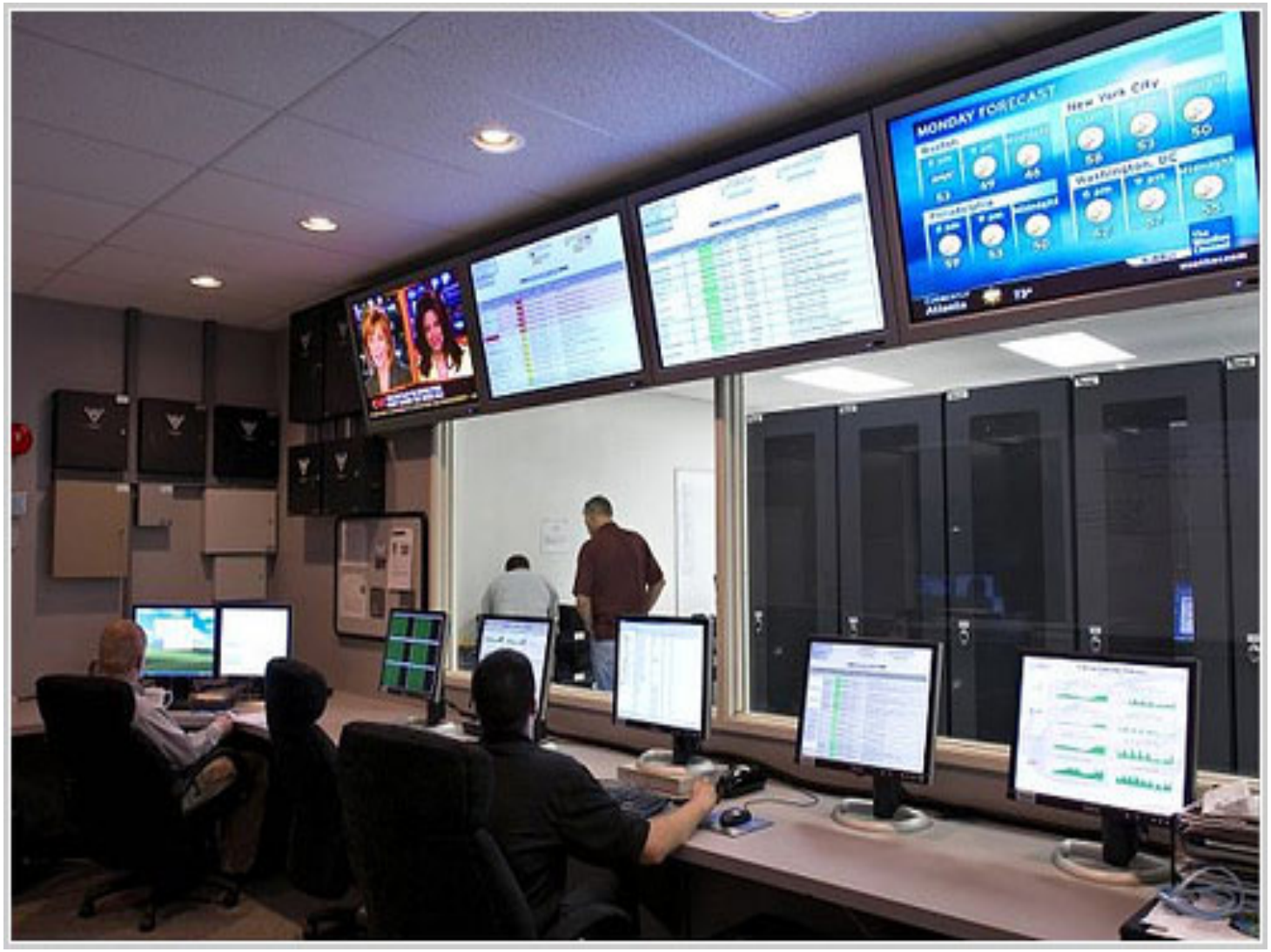
anthony.ventresque@ucd.ie

- The best way to contact me is by email.
- Feel free to get in touch with questions.
- Don’t expect immediate responses, I will endeavour to respond within 48 hours.
- When emailing please state:
  - Your name (as it appears on Moodle),
  - Your class (COMP30640), and
  - Your student number.
- Use the forum, if you have a question you think the class would like to know the answer.

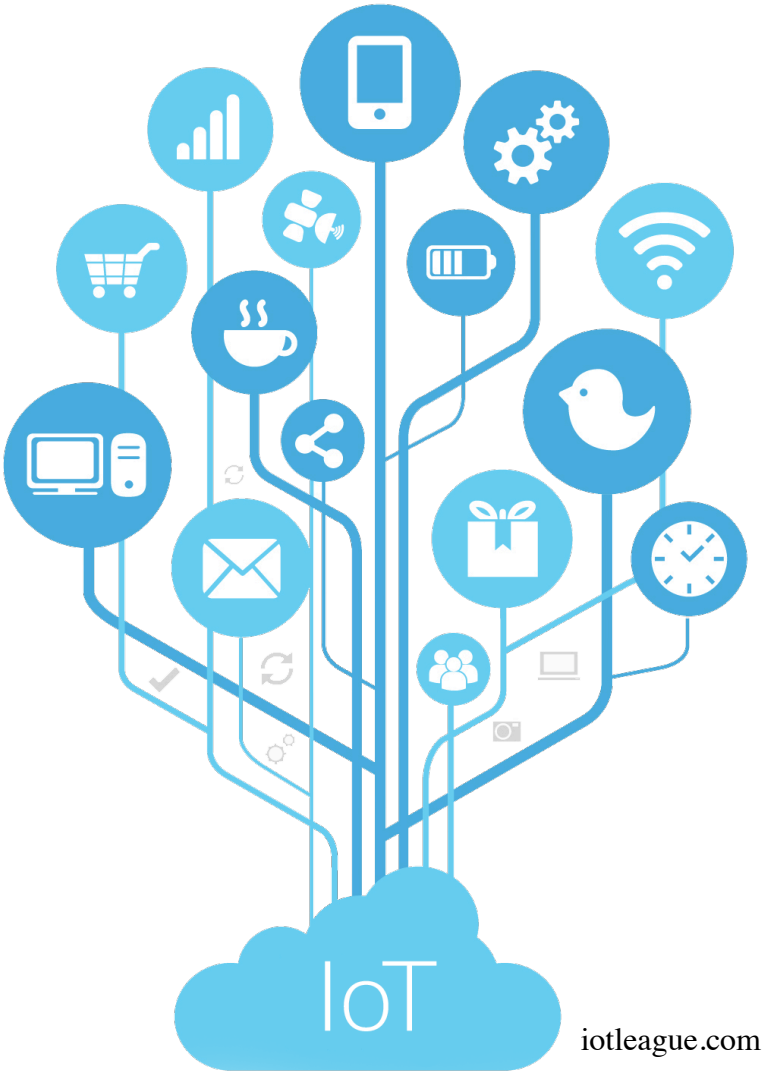
# How Does a Computer Look Like?

# How Does “the Cloud” Look Like?

# How Does “the Cloud” Look Like?



# What is Internet of Things?




iotleague.com

# What Does an Operating System Do?

# “Operating System”?

# What Does an Operating System Do?

- Creates a Virtual Machine to hide the complexity of hardware systems
- Coordinates resources and protect users and applications from each other
- Makes application development easier as it provides standard services
- Manages resources and processes so that fault are minimised, roll back is possible etc.

# Outline

- Structure of the Module
- Why Study Operating Systems
- Why Study System Programming (and Linux)

Take home message:

*Operating Systems are core elements of modern IT systems*

*A good understanding of how resources and processes are managed is critical for IT professionals*

# Module Aims

- What I want to give you in this module is:
  - A good understanding of the ***main concepts*** behind any Operating System
  - The ability to ***explain*** those concepts
  - The ability to ***implement some of these concepts***
  - An ***introduction to an OS***: (Ubuntu) Linux
  - The ability to ***write shell scripts*** (system programming) to interact with Linux system
  - The ability to ***solve problems with shell scripts***

# Syllabus

- Process Management
  - concurrency
  - mutual exclusion
  - synchronisation
  - scheduling
- Memory Management
- Storage Management
- Operating Systems for Mobile Computing and the Cloud

# Lectures and Assessment

- 2 lectures per week, with a quiz each week (***1% each = 10%***)
- 1 lab session per week (starting ***this week***)
  - Lab sessions are not marked
  - One project (***30%***)
- 1 continuous assessment (***20%***)
- 1 final exam (***40%***)

# Grading

https://www.cs.ucd.ie/Grading/

| Grade | Min | Max | Average |
|---|---|---|---|
| A+ | 95 | 100 | 97.5 |
| A | 90 | 95 | 92.5 |
| A- | 85 | 90 | 87.5 |
| B+ | 80 | 85 | 82.5 |
| B | 75 | 80 | 77.5 |
| B- | 70 | 75 | 72.5 |
| C+ | 65 | 70 | 67.5 |
| C | 60 | 65 | 62.5 |
| C- | 55 | 60 | 57.5 |
| D+ | 50 | 55 | 52.5 |
| D | 45 | 50 | 47.5 |
| D- | 40 | 45 | 42.5 |
| E+ | 35 | 40 | 37.5 |
| E | 30 | 35 | 32.5 |
| E- | 25 | 30 | 27.5 |
| F+ | 20 | 25 | 22.5 |
| F | 15 | 20 | 17.5 |
| F- | 10 | 15 | 12.5 |
| G+ | 8 | 10 | 9 |
| G | 5 | 8 | 6.5 |
| G- | 2 | 5 | 3.5 |
| NG | 0 | 0 | 0 |

# Plagiarism & UCD Computer Science

- Plagiarism is a serious academic offence
  - [Student Code, section 6.2] or [UCD Registry Plagiarism Policy] or [CS Plagiarism policy and procedures]
- Our staff and demonstrators are proactive in looking for possible plagiarism in all submitted work
- Suspected plagiarism is reported to the CS Plagiarism subcommittee for investigation
  - Usually includes an interview with student(s) involved
  - 1st offence: usually 0 or NG in the affected components
  - 2nd offence: referred to the University disciplinary committee
- Student who enables plagiarism is equally responsible
  - http://www.ucd.ie/registry/academicsecretariat/docs/plagiarism_po.pdf
  - http://www.ucd.ie/registry/academicsecretariat/docs/student_code.pdf
  - http://libguides.ucd.ie/academicintegrity

# Moodle

- All lectures notes, tutorial sheets, lab materials will be available on Moodle.
- Solutions will be provided to assessments, weekly quizzes, tutorials BUT only after they happen.

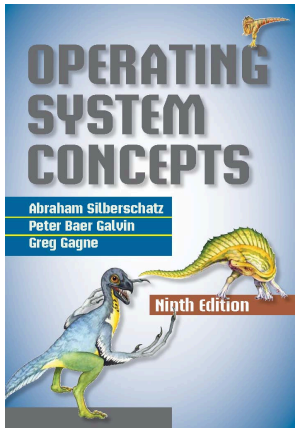
- Module “name”: COMP30640 Operating Systems 2018-2019
- Enrolment key = ***os-ucd-2018***

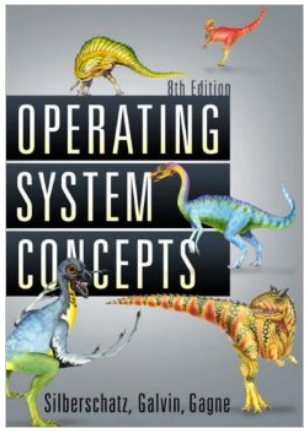
# Workload

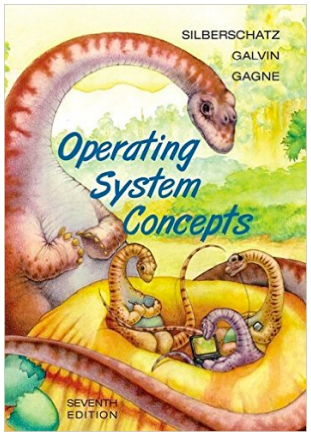
- Weekly Quizzes (~5/10 minutes)
- Lab sessions
  - Should be self contained
  - Use them to ask ALL the questions you have
  - (usually) extra question(s) if you want to go further
- Projects
  - Substantial amount of work to code a script/ application/algorithm
  - 24 hours (and 5 weeks to submit it)

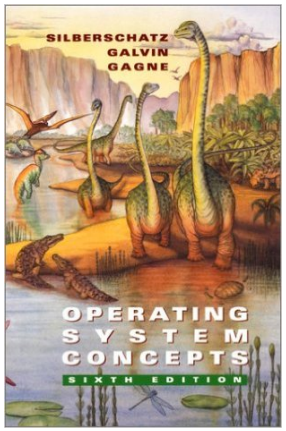
- In general take every opportunity to use what you do in this module for other modules and your every day life
  - Install Linux?
  - use command line for your other modules?

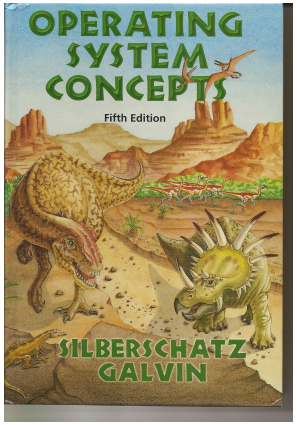
# Recommended Reading

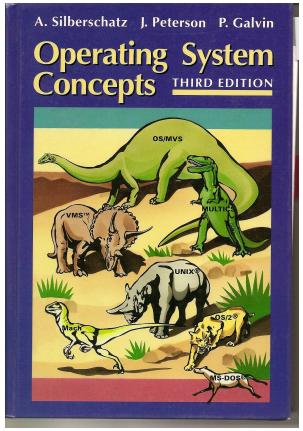


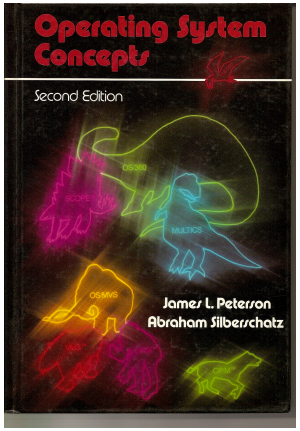



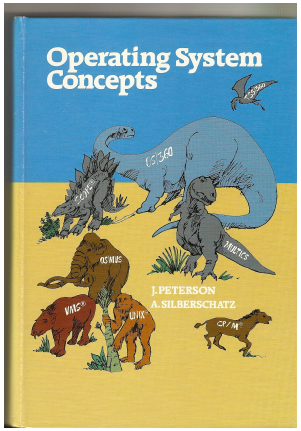



# Why Study Operating Systems?

## Because it is an essential part of the IT industry

*"There's no other company that could make a MacBook Air and the reason is that not only do we control the hardware, **but we control the operating system**. And it is the intimate interaction between the operating system and the hardware that allows us to do that."*
*Steve Jobs*

*"Nokia and RIM **needed a modern operating system**. They could have bought Palm or Android before Google did, but they didn't. Today, it's probably too late, and at the time they would have been criticized for overpaying, but as they say - shift happens."*
*Marc Andreessen*


*"One of my big regrets is that **Facebook hasn't had a major chance to shape the mobile operating system ecosystem**."*
*Mark Zuckerberg*

# Why Study Operating Systems?

To get a job










# Why Study Operating Systems?

To get a job

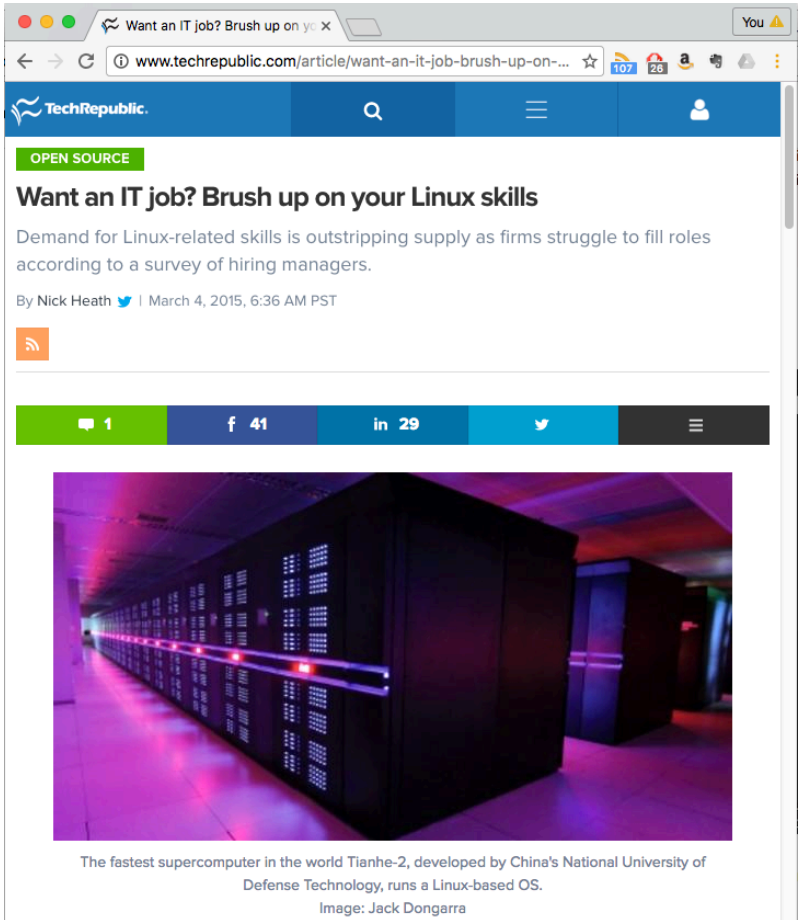
- What's the difference between a process and a thread?
- What's a virtual machine and how does it work?
- How do you do locking for a resource under high contention? with asymmetric read/write load? How do you write a reader-writer lock?
- Etc.

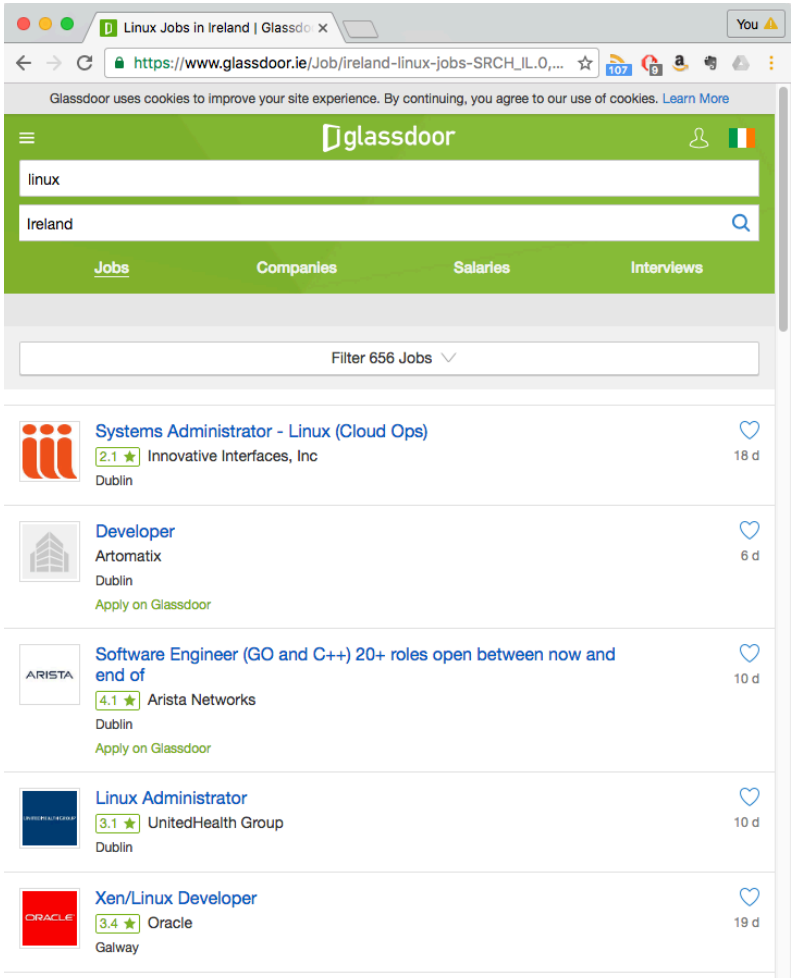
# Why Study Operating Systems?

- Many of you will create systems that utilise the core concepts in operating systems
  - Concepts and design patterns appear at many levels
- All of you will build applications that utilise operating systems
  - The better you understand their design and implementation, the better use you'll make of them

# Why Study Linux?

## To get a job



# Why Study System Programming?

- This is a very powerful way of doing things
  - quickly
  - efficiently (closer to the system than Python, Java etc.)
  - easily: simple to write and review
- Bash scripts are used by Systems Administrators, Programmers, Network Engineers, Scientists
- You can generally find a way to use system programming (bash scripting) to make your life easier

# Conclusion

- Operating Systems are core elements of modern IT systems
- A good understanding of how resources and processes are managed is critical for IT professionals
- Operating System:
  - Creates a Virtual Machine to hide the complexity of hardware systems
  - Coordinates resources and protect users and applications from each other
  - Makes application development easier as it provides standard services
  - Manages resources and processes so that fault are minimised, roll back is possible etc.