

ICS 362 Distributed Systems

Distributed Systems: Introduction

Lecturer: Toby Daniel

ICS 362 Distributed Systems

Grading

- Project 20%
 - Practical
 - Report
- Assignment (1) 10%
- Mid-term Exams 30%
- Final Exams 40%



Introduction

Give a general definition of the word

system



Introduction

What components are used to create a functioning **computer system**?



Introduction

What does an **information system** do?



Introduction

In your own words make a definition for a
computer information system



Introduction

What does *distributed* mean?



Introduction

What is the opposite (antonym) of distributed?



Introduction

In your own words write a definition of a
distributed system



Introduction

What real-life examples can you think of for a distributed system?

Computer information systems

- An information system is a system that collects and stores data.
- It is comprised of interdependent items that interact regularly to perform specific task(s).
- The hardware and software are components that make a computer system function.
- Any system needs an established or organized procedure; a method.

Distributed Systems

“A distributed System is a collection of independent computers that appears to its users as a single coherent system.”
(Tanenbaum).

“You know you have one when the crash of a computer you’ve never heard of stops you from getting any work done!” (Lamport)

Distributed Systems

- 2 Key aspects;
 - **HARDWARE** : A collection of computers, networked together in some way.
 - **SOFTWARE** : Appearing to the users as though they are using a single system.
- Distributed systems combine the 5 key systems resources - **People, Hardware, Software, Communication and Data.**



Distributed Systems

What is the point of having distributed systems?

Goals of Distributed Systems

- Easy to connect users and resources
- Hide the fact that resources are distributed
- Allow different systems to work together
- Allow the system to 'grow' in size and location

Connecting Users and Resources

- A key goal of distributed systems is to enable users to connect to resources;



Make a list of resources users might want

Connecting Users and Resources

Advantages

- enabling users to connect to physically distant resources, or people.

Disadvantages



What disadvantages can you think of?

Transparency

- An important goal of distributed systems is to hide the fact that processes / resources are physically distributed
- This enables users to use the system without worrying about where the resources are.
- There are 8 different types of transparency (we will cover these different types later in the course)

Openness

- A further goal of distributed systems is openness - that any resource conforms to a set of open standards. Doing so enables different parts of the system to make use of required services.
- This is normally achieved through modules which offer services which are specified through interfaces, using a standard IDL (Interface Definition Language).

Openness

- Distributed Systems should be complete and neutral, and in doing so should be interoperable and portable;
- ***Interoperability*** refers to how well 2 different systems (possibly from different manufacturers) can co-exist making use of each others services.
- ***Portability*** refers to whether an application written for system A can be used by system B.

Openness

- Another feature of open systems is flexibility. Systems should be flexible to enable users to specialise their interactions without affecting other users or components.
- Flexibility is often achieved through designing systems as a collection of small, replaceable or adaptable components.

Scalability

- A further goal of Distributed Systems is that they should be scalable - that is that they can grow;
 - Scalable by size; more users or resources can be added to the system.
 - Scalable by location; resources and users may be physically distant.
 - Scalable by administration; system can be easily manageable as it grows.

Scalability

- One problem often encountered when dealing with scalability is dealing with centralisation.
 - Centralised services
 - Centralised data
 - Centralised algorithms
- Imagine how the internet would work if there was only one single DNS table, and every address resolution request had to be directed through that computer.

Scalability

- Another problem affecting scalability concerns whether synchronous communication is actually possible.
- The laws of physics (including the speed of light), limits the speed of communication between physically distant resources.

Distributed Systems

“Just because it is possible to hide the fact that users are actually using distributed computers, doesn't mean it's always a good idea.”



When would you not hide a distributed system?

Key Requirements of Distributed Systems



Make a list of the Key Requirements
that we have just studied.