

Homework Assignment 1

ECE 151 / CMPSC 171 - Spring 2014

Due Monday, April 7

1. (a) Define each of the following attributes of a distributed system: **transparency**, **openness** and **scalability**. (b) Discuss two benefits that each of these attributes provide. (c) Describe two different ways in which you would implement each of these attributes.
2. (a) Discuss the differences and similarities between a **distributed operating system (DOS)**, a **network operating system (NOS)** and **middleware**. (b) Draw a diagram of the network stack and show where each of these pieces of software fits into the network stack.
3. Most **enterprise computing systems** are implemented as **three-tier distributed system**, with a Web Server in the first tier that provides an interface for the client, an Application Server in the second tier that provides business logic processing, and a Database Server in the third tier that provides access to a database. (a) Why do you think enterprise computing systems are designed in this way? (b) How do the components in the three tiers communicate with one another?
4. (a) Explain the difference between the **client-server model** and the **peer-to-peer model** of distributed computing. (b) For each of these models, give an example application for which it is most appropriate to use that model and explain why.
5. The **Internet of Things** is being promoted on TV by companies such as Cisco. In a domestic Internet of Things, home appliances can interact with each other, and can be monitored and controlled remotely. Such appliances might include kitchen appliances, laundry and cleaning appliances, lighting, heating and cooling devices, fire and burglar alarms, garden watering and maintenance devices, and anything else that you can think of. (a) Design a domestic Internet of Things that involves two or more such appliances and draw a high-level diagram of your design. (b) Do you need a centralized server to manage your distributed system? Explain why or why not. (c) Explain how the appliances can interact with each other without your explicit intervention. (d) Explain how each appliance can be, and needs to be, monitored and controlled.
6. Today's **embedded systems**, such as those in modern automobiles, contain lots of electronic devices. (a) Give an example of a feedback-control system in an automobile. (b) Describe at a high-level how the devices in that system provide feedback and are controlled. (c) Provide a high-level diagram of the feedback control system to illustrate your description.