

Problems III

I/O

Basics

- Computer I/O devices are of large diversity and their range continues to increase – from peripherals to sensors that provide the means for new applications such as context aware mobile apps.
- The device driver is the software that runs the I/O device controller with kernel privileges.
- A family of drivers abstracts in the kernel all devices of a particular type. As a member of a family, the driver inherits the data structures and the behaviours that are common to all members of the family. The bulk of a driver's interaction with its own family involves implementing member functions that are common to all family members.
- The driver executes commands, corresponding to applications I/O requests and it also handles controller's interrupts.

Problem 1

- One computer is using the complete fair queuing scheduler. Let's assume that four processes, A, B, C and D, issued requests for I/O operations with the same storage unit. As an example, requests arrive in the following order: RD(201)-A, RD(54)-C, WR(44)-A, RD(67)-B, RD(232)-D, WR(56)-C, RD(70)-B, RD(211)-D, RD(45)-A, RD(72)-B.
1. Use a diagram to show how this scheduling strategy works.
 2. Is this strategy fair all the time? Explain your answer.
 3. If your answer at question 2 is negative, can you suggest an improvement for that?

Problem 2

- A Linux computer is using the elevator scheduler. The first sector is 0 and the last one is 799. Consider the following sequence that indicates the operation and the sector number: RD(31), RD(131), RD(47), WR(89), RD(132), RD(142), WR(244), WR(625).
1. Use a diagram to show how the scheduler works.
 2. Is it better to return at the start and start again or serve newly arrived requests on the way back?
 3. Write the pseudo-code for the elevator scheduler.

Problem 3

- An Android device (e.g., smart phone) has an accelerometer to detect falls of elderly people and a thermometer. Consider that if a fall happens, it will take 1 or 2 sec.
1. What values should have the sampling frequency and the maximum reporting latency to detect the fall?
 2. Are the two sensors influencing each other's operation?

Questions

1. What is a device driver and why it is important to be member of a family of drivers?
2. What are the main components of a device driver?
3. Explain what happens when a new I/O device is plugged into the computer.
4. Explain the role of an I/O scheduler.
5. Can Android accommodate sensors without the application framework?
6. How is a sensor event represented and transmitted?