



Politecnico di Milano
Middleware Technologies for Distributed Systems
12th of February 2015

Rules:

- **You are not allowed to use books, notes, or other material.**
 - **You can answer in Italian or English.**
 - **Total time for the test: 1.5 hours.**
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1. Implement the LindaSpace class in **Java**. It provides a method to add an integer into the space, a method to read an integer from the space (without removing it), and a method to get an integer from the space (effectively removing it). Methods read and get suspend the caller if the requested integer is not present in the space. When a new element is added into the space, priority must be given to the readers of that element with respect to the getters of the same element.
2. Write in **TinyOS** a module PeriodicReader that periodically reads a sensor (wired to the Read<uint16_t> interface it uses) and returns the value read as an event. It must provide a method to start it (passing the reading period) and one to stop it. Write the interface and the implementation of the module. The following interfaces may help you:

```
interface Timer<precision_tag> {  
    command void startPeriodic(uint32_t dt);  
    command void startOneShot(uint32_t dt);  
    command void stop();  
    event void fired();  
}  
  
interface Read<val_t> {  
    command error_t read();  
    event void readDone(error_t err, val_t val);  
}
```

3. Write the **OpenMP** code (the minimal fragment of code you need) that takes a matrix M of integers (of size ROWSxLINES), calculates the average avgM of the values in M and fills a matrix N with the difference, element by element between M[i][j] and avgM, i.e., $N[i][j] = M[i][j] - \text{avgM}$.
4. Provide an in-depth explanation of the technical and architectural differences between SOAP-based **services** and REST-based services. When would it be preferable to use one solution, and when would it be preferable to use the other?
5. Suppose you are maintaining a system that allows people watching football matches at home to send a message stating their preference for the "man of the match" award. The messages that are received take the form of <timestamp, idUser, idMatch, ManOfMatch> tuples. Explain how you would design one or more **Hadoop** jobs that, at the end of the year, provide a list <ManOfMatch, count> tuples, where ManOfMatch is the name of a football player and count is the amount of times that particular football player was elected to be the man of a match.