Online Algorithms: Assignment 2 (10/11/2010)

- Please prepare your assignment by yourself, no collaborations are allowed. For any questions or clarifications please email me at adiro@lri.fr.
- You can either email me the solution as a pdf file (preferred), or bring it to class on 24/11.
- Some of the following problems are rather easy, others may require some thinking and work...
- It is not necessary to do all the exercises to get full points for the assignment. But try to do as many exercises as you can, since it will help you understand and learn the subject.

Problems

1. Prove that the BALANCE k-server algorithm (defined in class) is not competitive (i.e. does not have a competitive ratio which is a function of k and/or N) when $N > k + 1$ (Hint: it is enough to consider N=4).
2. Consider a metric space define by a $(\sqrt{n} \times \sqrt{n})$-mesh: two nodes that are adjacent in the mesh have distance 1, and the distance between any other two nodes is the length of the shortest path between these nodes on the mesh. Prove that there is a $k(\sqrt{n}+1)$-competitive deterministic online algorithm for the k-server problem on the $(\sqrt{n} \times \sqrt{n})$-mesh.
3. Prove that there is a 1-competitive deterministic online algorithm with $b = 1$ bits of advice per request for weighted paging (weighted paging was defined in assignment 1).
4. (*) Prove that the WFA for the k-server problem is 2-competitive for $k = 2$.