**CS/CE/TE 6378.003 Advanced Operating Systems**

**Summer 2015**

**Algorithm and Testbed Design (5%)**

**Submission due by Monday, 7/6 at 11:59pm CT**

1. **Purpose**

The purpose of this assignment is for your team to communicate and work to design a new distributed mutual exclusion algorithm and a testbed to compare it to Maekawa’s algorithm.

1. **Assignment**

Your team is expected to **design a new distributed mutual exclusion algorithm** while adhering to the following requirements:

* The algorithm **must be quorum-based**. Like Maekawa’s algorithm, algorithm messages should **only be passed between members of the same quorum**. Part of the algorithm’s design should be assigning nodes to quorums. The maximum quorum size should be where total number of nodes is in the system.
* The algorithm **must be token-based**. Like Raymond’s algorithm, mutual exclusion should only be granted once the requesting node has the token. **Only one token** **should be used**, and it can only be passed with an algorithm message (**which restricts the token from being passed between nodes that are not in the same quorum**).
* Your design **must include code to clearly explain the logic** behind the algorithm. The code can be written as pseudo code, C/C++, or Java, as long as the logic it represents is easy to follow. **Comments are highly recommended**.
* Your design **must include an example** of the algorithm **when two nodes make requests at the same time**. The example **must be diagrammed** and **show all messages passed** during the algorithm’s operation. Since this is a distributed mutual exclusion algorithm, one node’s request will obviously be delayed, but eventually should be granted.

In addition to designing a new algorithm, your team is expected to **design a testbed for comparing the new algorithm to Maekawa’s algorithm** while adhering to the following requirements:

* The testbed should be **configurable, with the ability to indicate which nodes make requests and when** (hence, synchronization is a requirement). Configuring the testbed should at most take a minute or two.
* The testbed must be able to **support a minimum of 16 system nodes** for both algorithms. Keep in mind that **the CS Department’s networking machines** (i.e., netXX.utdallas.edu, where XX ∈ {01, 02, …, 45}) must be used to eventually implement your testbed.
* The testbed must be able to **demonstrate that mutual exclusion is not violated**. Keep in mind that documenting when a node enters its critical section is not enough. Also, beware that the CS department’s networking machines use a distributed file system.
* Your design **must include a description and diagram of how the testbed will be implemented**. Your description and diagram should make it clear how you are addressing the other testbed requirements. Additionally, you should **describe what metrics and benchmarks will be used for assessing the performance of the two algorithms**.

1. **Submission**

Your team’s Manager and/or Lead Developer are expected to submit this assignment **through email to TA** by the deadline indicated above. The submission **must be either a Word document (.docx, .doc) or a PDF (.pdf) document**. **Use your team name separated by spaces to name your file** (e.g., “AOS Comets.pdf”).

1. **Grading**

Your team’s grade for this assignment will start at 5 points. For each criterion your team fails to meet, the team grade will be reduced by the indicated deduction. The minimum possible grade is 0.

* The algorithm is quorum-based **(5 points)**.
* The algorithm includes quorum assignments with a max size of nodes **(2 points)**.
* The algorithm is token-based with only one token **(5 points)**.
* The algorithm design includes code that makes it easy to understand **(2 points)**.
* The algorithm design includes a diagrammed example of competing requests **(2 points)**.
* The testbed design supports both your new algorithm and Maekawa’s **(5 points)**.
* The testbed design includes details for easily configuring the testbed **(2 points)**.
* The testbed design supports at least 16 system nodes **(2 points)**.
* The testbed design details how mutual exclusion will be demonstrated **(5 points)**.
* The testbed design includes a diagram of the envisioned system **(2 points)**.
* The testbed design describes what performance metrics will be collected **(2 points)**.
* The assignment is submitted via eLearning by the indicated deadline **(1 point/day late)**.
* The submission is a Word (.docx, .doc) or PDF (.pdf) file **(2.5 points)**.
* Issues are created and assigned in JIRA for the major tasks expected **(2.5 points)**.

1. **Academic Integrity**

While this is a group assignment, groups are expected to submit their own work. ***Concept and code sharing between groups is strictly prohibited and will result in disciplinary proceedings***. Analysis software will be used to determine if code sharing has occurred.

**These descriptions and timelines are subject to change at the discretion of the instructor.**