CS454: Software Engineering 3

Assignment 2 - RMI

Cairo University, Faculty of
Computers and Artificial Intelligence

Objective

Using the concept of RMI and synchronization, implement a simple peer-to-peer system that provides support for storing a large set of <Key, Value> pairs among **a group of nodes/peers**. The system exports two operations to the clients, Find() and Store.().

Features

- ✓ Each **Node/Peer** has a **group** (of connected nodes), has a **set** of <Key, Value> pairs, a **maximum storage capacity** and have the following operations:
  - The **Find** operation searches for the value corresponding to a given key – if not found on this node search in the connected nodes (group members) [using efficient graph search technique]
  - The **Store** operation stores a < key, value > pair in the system – if the node capacity is reached, should store on another.
- ✓ **Dynamic Groups:** Nodes can delete a node connection and/or add a new node connection
- ✓ **Failure:** A failure in the search operation due to disconnecting from a node that has the needed information.
- ✓ **Data Replication:** should implement a data replication technique [more than one node in the group stores the same information] to decrease the failures.
- ✓ **Calculate system performance:** measure the **average response time** and the **failure rate** for the Find operation.

Testing Scenario

Group A: Node A1, Node A2, Node A3

Data stored on Node A1: <k1,v1>,<k2,v2>,<k3,v3>
Data stored on Node A2: <k4,v4>,<k5,v5>
Data stored on Node A3: <k6,v6>,<k7,v7>

Group B: Node B1, Node B2, Node B3, Node B4, Node B5

Data stored on Node B1: <k2,v2>
Data stored on Node B2: <k4,v4>,<k5,v5>
Data stored on Node B3: <k3,v3>
Data stored on Node B4: <k1,v1>,<k7,v7>
Data stored on Node B5: <k6,v6>,<k8,v8>

A1 searches for k1 //found on A1
A2 Searches for k6 // found on A3
B4 Stores <k9,v9> //store in more than one node according to the implemented data replication technique
B5 removes B4 from its connections
B5 searches k1 //failure
A1 add B5 to its connection
B5 searches k1 //found on A1

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Notes

- ✓ **P.S.** You must handle any exceptions that may occur.
- ✓ **Team size:** The assignment should be done in teams of size 2 at most.
- ✓ **Programming language:** The assignment should be done using Java programming language.
- ✓ **Submission:** You should submit all the needed source code to properly run the application, as one zip file. Submission should be done solely through Blackboard. Email submissions will be ignored.
- ✓ **Deadline: Dec. 22nd, at 11:59 pm.**