Distributed Read Write : Project Documentation Principle of Distributed Systems

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1 Introduction

THIS is the documentation of the project. This file details all aspects of design and implementation of the project.

2 Network Topology Design

2.1 Node

In Network term, a node is a machine or process that can be identified by the ip-address and the port associated with it. We construct our node to maintain addresses of other connected nodes :

```
Node {
   self_addr = (ip_addr, port)
   list<Address> neighbor
}
```

2.2 Cluster

Define a network cluster as consisting of one or more nodes with connections between them. Mathematically, it is a tuple $C = (N, E)$ where:

- $N = \{n_1, \ldots, n_m\}$ is set of nodes.
- $E = \{\{n_i, n_j\} \mid n_i, n_j \in N \wedge i \neq j\}$ denotes the connection between all of the nodes.

Several clusters can exist simultaneously. Each cluster is a logical network in its own right. We shall now discuss the way the clusters form network connections among themselves.

2.3 Join and Sign-off

A cluster $C_i = (N_i, E_i)$ (which may as well contain just a single node) joins another cluster $C_j = (N_j, E_j)$ when one of the nodes of C_i sends the **join** request to one of the nodes of C_j, thus forming a new cluster:

$$C_{ij} = (N_i \cup N_j, E_{ij})$$

$$E_{ij} = E_i \cup E_j \cup \{\{n_i, n_j\} \mid n_i \in N_i \wedge n_j \in N_j\}$$

The two nodes exchange their neighbour lists which are propagated in the respective clusters. At the end of this process, all nodes will have updated their neighbour list to contain the nodes of the newly formed cluster.

2.3.1 Join Procedure

```
procedure JOIN($n_i \in N_i, n_j \in N_j$)
    if $n_i \in n_j$.neighbour then
        return
    end if
    old_neighbor ← $n_j$.neighbiur
    for all $n \in (n_j$.neighbor $\cup\{n_j\})$ do
        for all $m \in n_i$.neighbor do
            $n$.neighbor.append($m$)
        end for
        $n$.neighbor.append($n_i$)
    end for
    return old_neighbor
end procedure
```

2.3.2 Sign Off

A node n_i can sign out of a cluster by sending **sign-off** message to all other nodes. They respond by deleting the node n_i from their neighbor list.

3 Master node election

4 Distributed Read write

5 Conclusion