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Resource Sharing With Mobile Nodes

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Abstract— Resource Management in wireless is concerned with a system in which the main aim is to make sure that a user/client can access the remote resources with as much ease as it can access the local resources. The basis of Resource Management is also resource sharing. The main goal of this project is to ease the sharing of resources among mobile users. We are going to implement a Peer to Peer system where files are our prime resources. Any two mobile nodes within a network can access their resources provided they are authenticated. A graphical user interface is made available at each peer for registering itself to the network, for searching required file and if found, displaying its contents. In our proposed system we are implementing resource sharing (file, image etc.) security by authentication, fast query solving in wireless environment.

Index terms—Peer-to-peer resource sharing, peer-to-peer networks, P2P, super-peer selection, super-peer, mobile nodes

INTRODUCTION

Peer-to-peer (P2P) systems are constructed to provide resource sharing among interested participants (peers) in decentralized way. We can also define our user based topology for peer to peer network. Mobile environments pose additional challenges on P2P networks due to heterogeneity of nodes, built in limited resources, dynamic context and wireless network characteristics. When it comes to P2P file sharing specifically, there are two models: centralized and decentralized. In the centralized model, the central servers maintain directories of the files shared by the users of the system. The servers allow query of their database and provide results that allow a user doing a query to establish a direct connection with a user who is sharing a desired file.

In super-peer overlay infrastructures, the network topology is constructed in three layers. First layer contains server, which maintain directories for super peer. Second layer contains nodes called *super-peers* (or *super-nodes*) that have relatively higher capability and assume special responsibilities. The third layer contains all other peers (called *ordinary peers*). Super-peers handle the communications inside their corresponding cells as well as exchange information with other super-peers. Query resolving (resource discovery) in super-peer architecture is much faster than any other P2P topology. However, super-peer selection is challenging due to the many factors that govern the selection decision which have direct impact on the super-peer performance.

The choice of the underlying network architecture has a great impact on the overall system performance. Super-peer networks take advantage of centralized schemes. It also introduces a reliability improvement scheme that reduces the network maintenance overhead, while improving the overall network reliability and stability. In addition, it reduces the overdue burden on resource-constrained nodes by distributing loads evenly across the network.

P2P file sharing networks can be classified into four basic categories: the centralized, decentralized, hierarchical and ring systems. These topologies may exist on their own it is usually the practice for distributed systems to have a more complex topology by combining several basic systems to create, what is known now as hybrid systems. This thus gives P2P systems two main key characteristics:

I. Scalability: There is no limitation for extension of size of system, e.g. the performance measure of the system should be somewhat constant regardless of number of nodes in the system.

II. Reliability: The failure of any given node will not affect the whole system (or maybe even any other nodes).

III. Allowing users of the network to schedule batch-jobs that are processed by the computers on the network during their idle time thereby decreasing the need for new computing resources; and

IV File sharing: Allow users to exchange data directly without storing files on a centralized server thereby avoiding the need to establish a centralized server and allowing two businesses to communicate with each other directly.

RELATED WORK AND CONTRIBUTION

Resource sharing in P2P systems is done in ad-hoc fashion. Peers that request or offer access to resources voluntarily participates in process and have the option to join and leave the network. Many research efforts are done in the super-peer selection algorithms and maintenance schemes of topology because of the introduction of the super-peer P2P network architecture. Some of these researches introduced several modifications to the original design of Gnutella in order to accommodate node heterogeneity. Some proposed a double-layered P2P system, in which super-nodes are selected based on their mobility pattern in order to enhance the system stability and reliability. They also believe that the node energy level should be taken into consideration along with the mobility factor. Also some people contributed to propose a super-peer topology construction and maintenance scheme based on network coordinates.

In contrast to these previous research efforts, Khalid et. Al [1] integrated many factors to efficiently select super peers, including the node’s current mobility, immediate energy level, and connectivity degree. Current energy level assigns a higher priority to nodes with higher network connectivity. The connectivity degree aims to balance the node load (number of served peers) with its capacity and uniformly distribute the

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peer load across the network topology. In this proposed system they have considered one cache memory for server instead of storing block of data it only store entry of that document where it locate on which node in that network. Due to which increase time efficiency of resource sharing also less memory get utilizes.

OVERVIEW DESCRIPTION

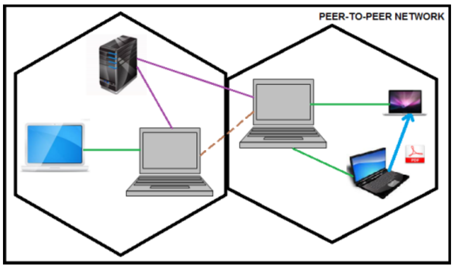
We design robust peer to peer architecture for resource sharing among mobile devices by providing semi-centralized control over system with the help of efficient super peer selection. The design of RobP2P boils down to a three-fold objective:

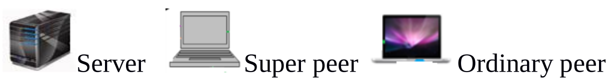
1) Develop a robust and efficient super-peer selection protocol;

2) reduce the overhead traffic of network topology maintenance;

3) Increase the reliability and stability of the network infrastructure through enabling peers to flexibly change their role.

We have considered one main server, single super peer for each cell and multiple ordinary peers. Every element has its specific work. This system design is mainly used to select super peer among all peers that leads to solve query efficiently.

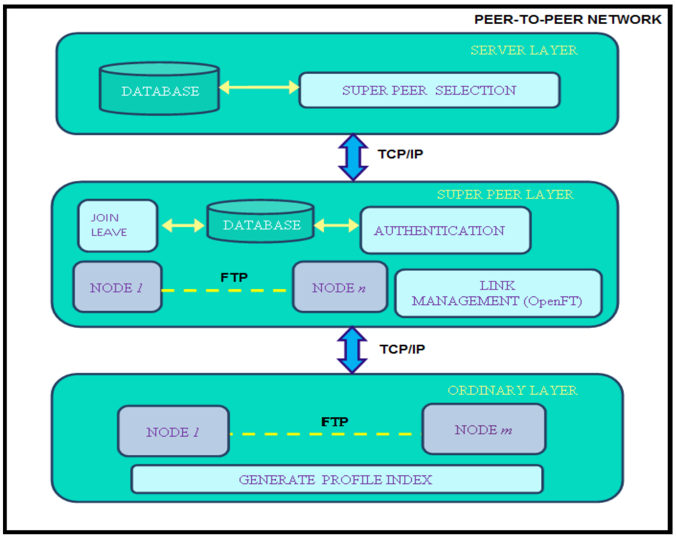




Super peer manages co-ordination among its connected nodes. Resource sharing can be done within nodes which are in own cell through super peer. But in case when resource sharing has to be done within nodes belonging to different cells, it will be done through server. Link management works when any node leaves its cell and enters into another cell or it destroys. This information needs to be update at server side.

SYSTEM ARCHITECTURE

System Architecture is structure of components, their externally visible properties and relationship between the components. We are considering three layered architecture in which first layer is 'Server Layer' which maintains database of super peers. Selection of super peer is done in this layer. Second layer is 'Super Peer layer' which controls Ordinary peers within their own cells. Third layer is 'Ordinary peer layer' which are involved in the sharing of resources. The resource sharing among ordinary peers is authenticated by super peer.



System Architecture

The P2P network is divided into multiple regions. Each region represents a location-based group that contains peers that are physically located with the region boundaries. Algorithm 1 shows the group initialization procedure. Each group selects a super-peer that represents the group head, while the rest of the peers become ordinary peers. All peers calculate their profile index using the function in Equation (1) and participate to the super-peer selection following Algorithm 2. Once super-peers are selected, all advertisements and queries within groups are sent to respective super-peers. Super-peers collect and index the group information including active peers, advertised resources, and offered services in order to manage the group communications and resolve queries addressed to the group. The super-peer is also responsible for maintaining the group state including selecting new super-peers, in case it moves away from the group's centroid.

The selection of super peer is done only when the performance of current super peer degrades and it send signal about its status.

A. Join/Leave

The newly joining peer calculates its profile index based on the network *utility function* and update profile index arrange them into descending order. If the performance of current Super Peer degrades then it will inform to server and server will give command to perform selection of super peer algorithm. Then new super peer will select on basis of profile index. Super-peer, the new peer takes over the super-peer responsibility. Then, the current super-peer downgrades itself and sends an update message to the group declaring the new

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super-peer. This message updates the role of the current super-peer and provides the ID of the new super-peer.

B. Super peer selection

Super peer is nothing but an ordinary peer which manages control over a cell in a network. Main functionality of super peer is link management among peers. Selection of super peer is done by using super peer selection algorithm. Selecting super-peers in P2P systems is always challenging. A super-peer must be capable to improve the overall performance of P2P networks.

Battery - super-peers must possess sufficient resources to handle the group communications and resolve queries with reasonable delay.

Mobility - peers with low mobility profiles must be given higher preferences to avoid frequent super peer selections.

Network connectivity - Super peer must connect more devices within cell and provide sufficient connectivity to each node.

C. Super peer selection algorithm

To measure whether a peer nj is a candidate to assume super-peer responsibilities in a group Gi, we define the peer profile using the utility function in Equation (1). In this equation, b is the current battery power level on nj, Emax denotes the maximum energy level that any peer belongs to Gi might have, m is the current mobility pattern of nj, Mmax is the maximum mobility nj can reach, ut is the normalized mean uptime of nj, which denotes how stable the peer is, NC represents the network connectivity, i.e. how many peers in Gi can reach nj, w1 w5 are weights that represent the factor importance, where 5k =1 wk= 1. In this utility function, we reverse the peer mobility, since peers with low mobility pattern are of higher preferences. The peer profile ranges from 0 to 1. The higher the profile value, the more possibility a peer could be selected as a super-peer. Each peer in Gi calculates and shares its profile with other peers. The peer with the highest profile declares itself the super-peer serving Gi.

Input: Ni : Set of nodes in Gi

Output: ncurrent.leader

ChooseLeader (Ni)

1. nj.profile = calculateEqu1 (nj)
2. ncurrent.leader = ncurrent
3. best profile = 0
4. while selectionduration and msgrecvd do
5. if msgrecvd[nj.profile] > bestprofile then
6. ncurrent.leader = nj
7. bestprofile = nj.profile
8. end

D. Profile Index equation

$$n_j.profile = 1/3\left(w_1\frac{n_j.b}{E_{max}(G_i)} + w_2\frac{M_{max} - n_j.m}{M_{max}} + w_3\frac{n_j.NC}{|N_i|}\right)$$

Where,

nj.profile: profile index of peer

wi: weight of each factor

b: battery of a peer

Emax (Gi): maximum energy level that any peer belongs to Gi

Mmax: maximum mobility nj can reach

m: current mobility pattern of nj

NC: network connectivity, i.e. how many peers in Gi can reach nj

[Ni]: Node connectivity, i.e. how many peers can reach nj

E. Join Algorithm

This algorithm is used when any new node want to enter into the network. Firstly newly entered node is an ordinary peer then its profile index gets generated. Then authentication to that peer is provided by already selected super peer and also takes all records of that peer for file sharing. If current super peer is degraded its performance then using super peer selection algorithm is used to select new super peer using their profile index already generated. Profile index is generated after some interval time.

Input: nnew: new node to join Gi,

Output: null

Join (Gi)

1. nnew.profile= calculateEqu1(1)
2. Broadcast(new join,nnew.ID, nnew.profile)
3. while wait duration do
4. if msgrecvd[nj.profile] ¿nnew.profile then
5. ncurrent.leader = nnew
6. break //i.e. end search
7. end
8. end
9. best profile = nnew.profile
10. Broadcast(ncurrent.leader, bestprofile)

F. *Leave algorithm*

This algorithm is used when any node leave network. If that node is ordinary peer then all records stored in super peers database get deleted and database gets updated. But if that node is super peer then it needs to more stuff that is super peer has database of all ordinary peers within that cell. If that peer leaves the node firstly it had to broadcast message so that server can choose new super peer and also transfer all database to new super peer.

Input: ncurrent.leader: Super-peer

Output: nnew. Leader
Leave (Gi)

1. ncurrent.leader delegate (nnext best)
2. best profile nnext best .profile
3. Broadcast (ncurrent.leader, best profile)

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