A Social P2P Networking Based on Interesting Keywords

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***Abstract*—Recently, one of the most popular applications on the Internet is the social networking, such as, Facebook and Twitter. Finding resources using recent Peer-to-Peer (P2P) schemes in a social network has limits, such as distance problem between peers etc. So, in this paper, we present an efficient social P2P management scheme based on interesting keywords. We compare our proposal with the recent P2P scheme to evaluate the interesting keyword based P2P.**

Keywords-Social Network; Social P2P; Keyword based P2P

I. INTRODUCTION

Recently, one of the killer applications of the Internet is the social networking [1] which has representatives like Facebook and Twitter, etc. Network means an interaction between nodes which are made up of peoples or groups. Using a social network, people make relationships on the Internet or solve problems with help from people or group which have solved similar problems already. The Social network is expected to develop into a more complex and varying architecture in the future.

Peer-to-Peer (P2P) [2] technology is not similar to the recent server/client type technology which depends on a few central server among peers participated in the network. P2P technology is a method that shares resources like a public contents and computers among peers. P2P means a distributed computing paradigm. P2P network also means simple network topology. P2P is a server/client type in which all peers participate in the network equally. But, when a peer sends a query message for searching resources in the social network, it might have limits such as, real distance problem between peers and the number of nodes joined for P2P sending same messages to other peers. It may cause a load problem in social network. Therefore, a new P2P scheme is necessary for the social networking.

Social P2P [3] [4] is a P2P scheme for social networks. Social P2P is proposed to solve problems in social networks. However, recent social P2P schemes use a list searching way to search resources. As a result, it may increase the number of query messages in a social network. Hence, it may cause an overload problem.

In this paper, we present an efficient P2P scheme for searching resources in a social network. We use interesting keywords which are gathered from neighboring peers to search resources and register neighbor's interesting keyword in the interesting keyword table. We select a representative keyword which it is one of the most mentioned keyword via interesting keyword management table.

The remainder of this paper is organized as follow. Section 2 discusses related works. Section 3 introduces our proposal which is an interesting keyword based P2P and its operation of resource searching. We present the result of comparison in section 4 and we conclude our work and present our future works in section 5.

II. RELATED WORK

In this section, we describe social network, recent P2P and social P2P.

A. Social Network

Social network is a part of web sciences. Social network means a social relationship which is made as an interaction between nodes that consist of people or social groups on the web. Figure 1 shows a social network concept.

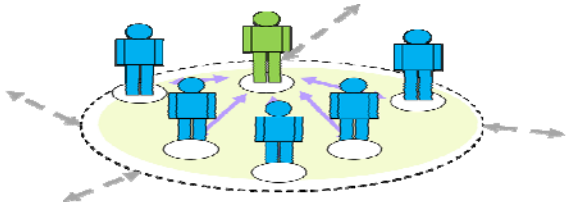

Figure 1. Social Network

This group can help group members to share their information and problems using interaction via group members. A person's best way to solve a problem is to ask other people who already have experience and can advise. A person has many relationships with other humans for different purposes and solves many problems via these relationships. In other words, a person can solve a private problem using the human relationship network.

On the other hand, the theory of social network analyzes relationship between two persons who have a high relation. When people make a connection, Social network is made dynamically. This theory can adapt to a knowledge network which requests knowledge and shares knowledge among group members [5]. This interaction such as sharing knowledge in a

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similar interesting area also can be adapted by social network theory.

B. *Recent P2P*

P2P technology is not like the typical server/client technology which depends on a few central servers among peers participating in the network. P2P technology supports a network in which a method shares resources like public contents and computers among peers. Figure 2 shows a traditional P2P network. P2P means a distributed computing paradigm. P2P network also means simple network topology. P2P is a server/client type and all peers participate in the network equally.

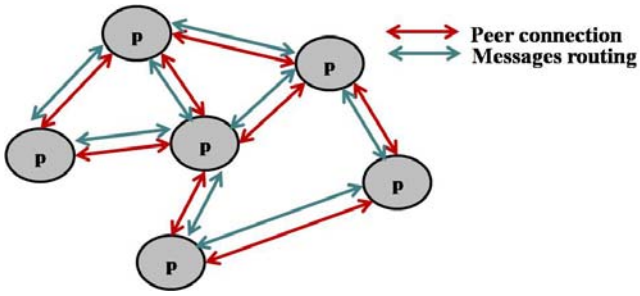

Figure 2. Traditional P2P Network

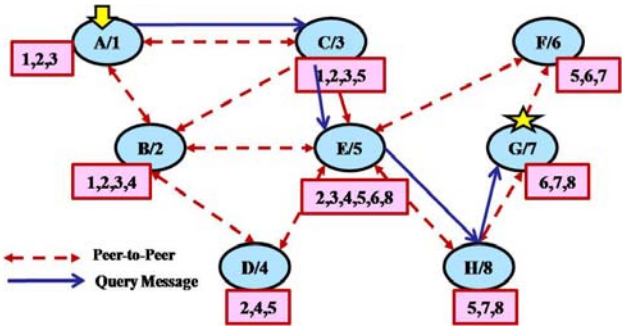

Figure 3. Searching resource using Distributed Hash Table (DHT)

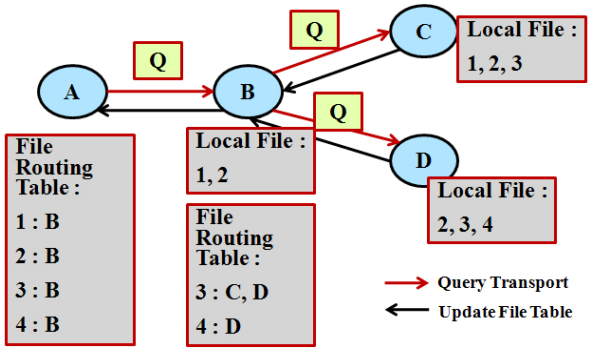

Figure 4. Searching resource using Optimized

Routing Independent Overlay Network (ORION)

Many schemes related to P2P, such as DHT [6] and ORION [7] etc., are developed for the discovery and sharing of resources in the P2P networks. Figure 3 and 4 show searching algorithm in ORION and DHT. DHT searching algorithm uses distributed file and node information for fast and correct searching. DHT sends necessary query message using routing table which has neighboring node information.

ORION is a search algorithm based on a keyword. ORION manages a path routing table and a file routing table using unified query messages which are on the application layer and the network layer, respectively. ORION's path routing table is similar to AODV (Ad-hoc On-demand Distance Vector) [8] routing table. File routing table reduces network traffic while maintaining required file's path information. And it improves the reliability with correct file searching.

These schemes (DHT, ORION) help to reduce the number of query messages in searching resources. But these searching ways may not be suitable for social network.

C. *Social P2P*

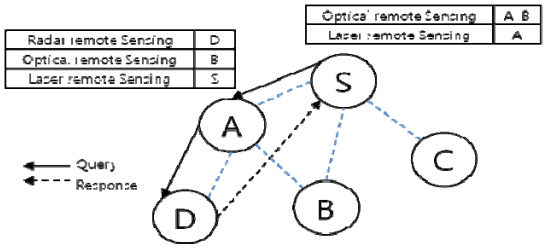

Figure 5. Social P2P

Social P2P is a kind of P2P technology, which uses people's relationship to find required resources in the social network. In social P2P, each peer is a person and peer connection means a relationship for the social network. As each peer is connected to other peers via an interest, it does not cause overhead to get additional information as in an unstructured P2P scheme. Therefore, users can search for more correct resources to provide satisfactory user's requests. Figure 5 shows a social P2P routing mechanism. However, recent social P2P uses just neighbor list searching for searching resources. Therefore, this scheme may increase the number of query messages as the searching progresses.

III. PROPOSAL

In this paper, interesting keyword based social P2P, which use neighboring peer's interesting keywords, is proposed to manage various user's interesting area.

A. *A Social P2P Based on Interesting Keywords*

Figure 6 (a) shows basic architecture for interesting keyword based social P2P. As peer *A* has two social relationships, social P2P has two P2P group in Figure 6 (a). In this P2P, each peer has an interesting keyword management table. This table includes neighbor's interesting keyword, which the peer uses to select its neighboring peer.

Peer *A* has a keyword management table and registers neighboring peer's interesting keyword, as shown in Figure 6 (b). When peer *A* wants to search a resource, it checks its interesting keyword management table. If peer *A* could not find a resource, peer *A* sends a query message over the edge of

neighboring peers. When a new peer joins an interesting group, peer *A* compares keywords management table with the new peer's keyword.

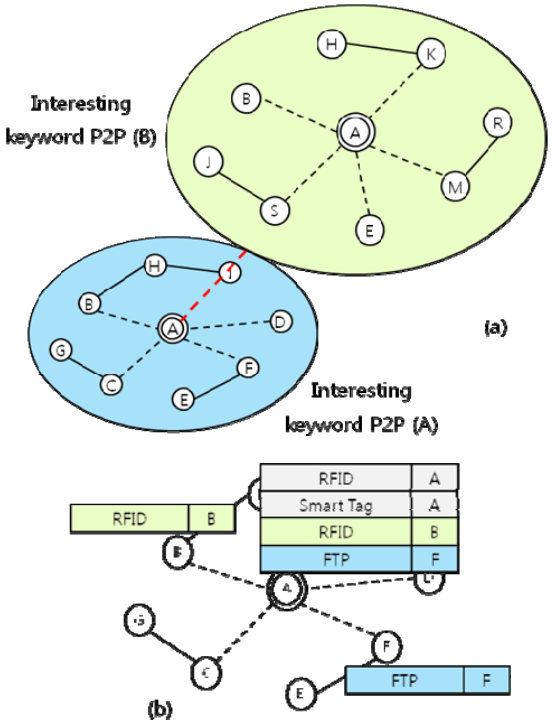

Figure 6. (a) Proposed social P2P architecture

(b) Interesting Keyword Management Table

If the new peer *A* joins social P2P network, peer *A* follows the process as shown in Figure 7. Peer *A* gets resource information from its neighbor. Then peer *A* selects representative keywords, which is one of the most mentioned keyword, via interesting keyword management table.

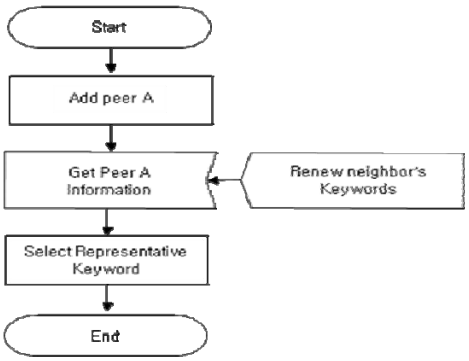

Figure 7. A flowchart of joining new peer

Table I shows an interesting keyword management table. This table includes interesting keywords in peer *A* itself and neighboring peers. Peer *A* selects representative keyword which is one of the most mentioned keyword via interesting keyword management table. In table I, peer *A* chooses its representative keyword from interesting keyword management table.

Table I. Interesting Keyword management Table at peer A

The number of mention	Representative Keyword
2	Interesting Keyword 2
-	-
Peer Name	**Interesting Keyword**
A	Interesting Keyword 1
A	Interesting Keyword 2
A	Interesting Keyword 3
B	Interesting Keyword 2
-	-

B. A Scenario of Searching Resources

Figure 8 shows a scenario of searching resources in our scheme. The scenario progresses as follow. If peer *A* wants to find resource "☆", peer *A* checks its interesting Keyword management table. If peer *A* finds resource "☆" in the keyword management table, peer *A* sends query message to its neighbor which has keyword "☆". On the other hand, if peer *A* can't find resource "☆" in its table, peer *A* sends a query message comparing similarity with each peer. This query message includes peer *A*'s representative keywords. Every Peer which receives peer *A*'s message, checks its interesting keyword management table to find a peer that has higher similarity comparing representative keywords of peer *A* with other peer's representative keywords. Via this progress, peer *A* gets the resource information.

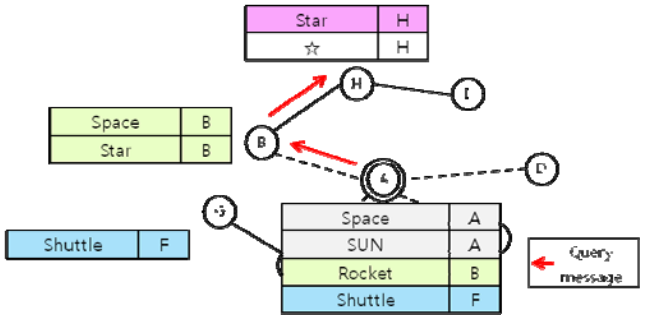

Figure 8. A Scenario of Proposed social P2P scheme

As peer *A* can't find resource "☆", peer *A* compares representative keywords with neighbors' representative keywords. Via comparing, peer *A* gets an information that peer B's representative keywords is more similar than peer *F*'s. Therefore, peer *A* sends a query message to peer *B* to find resource "☆". Also peer *B* looks up its keyword management table after receiving query message from peer *A*. As peer *B*'s keyword management table doesn't include resource "☆", peer *B* performs a progress of comparing representative keywords with peer *B*'s neighboring peers. Finally, peer *B* gets an

information of resource "☆" in peer *H*. Peer *B* transmits peer *A*'s query message to peer *H*. Then peer *H* replies to peer *A*.

IV. EVALUATION

We propose a new scheme using interesting keyword to discover resources efficiently. In this section, we compare our proposed interesting keyword based social P2P with other P2P schemes to evaluate our scheme; the results are shown in table II.

TABLE II. Comparing our keyword based P2P with other P2P

Characteristic / System	Neighborhood	Resource Discovery
Recent P2P	Using Neighbor Peer's IP Address	Discovery using flooding
Social P2P	Configuration of Interesting Group Using Query Message	Discovery using neighbor list
Interesting Keyword based P2P	Configuration of Interesting Group Using Keyword	Discovery using neighbor keyword and flooding

In recent P2P, IP addressing is necessary to develop neighboring Peers. However, both social P2P and proposed P2P can develop their neighboring peers to evaluate peers. In resource discovery phase, recent P2P uses flooding to find resources. Recent social P2P can discover resources with neighbor list. Our scheme can find resources using neighbor keyword and flooding with similarity of representative keywords. To discover resources, our proposed scheme looks up its interesting keyword including its neighbor's keywords. If there are no resources in the keyword management table, our scheme sends query message using flooding over its neighbor peer's edge with comparing similarity of representative keywords between neighboring peers.

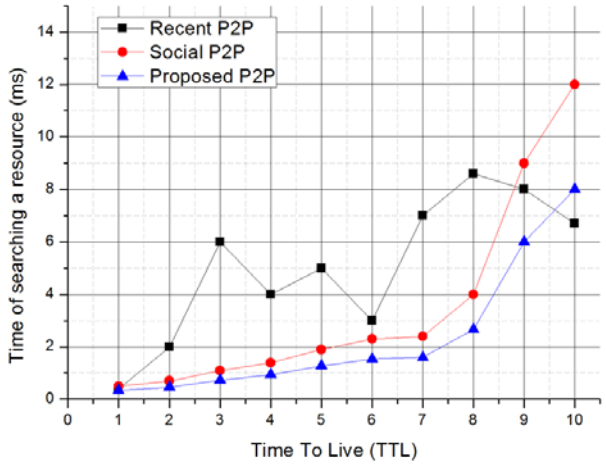

Figure 8. A Scenario of Proposed social P2P scheme

To evaluate the performance of our P2P scheme we have performed simulation using C codes. To reduce error we calculate the average for 100 times of simulation.

Figure 9 shows simulation result. We increased the number of TTL (Time To Live) [10] and compared with time to find a resource between recent P2P, social P2P and our interesting keyword based P2P scheme. Recent P2P scheme shows random time in figure 8 as recent P2P scheme makes a neighbor randomly. Social P2P and our proposal scheme show similar graph. Because social P2P and our interesting keyword based P2P make a neighbor using similar ways. Via the simulation, we got results which show that our interesting keyword based scheme is more efficient than other P2P schemes in resource searching progress.

V. CONCLUSSION

In this paper, we introduce a new scheme of interesting keyword based P2P as using neighbor list is not an efficient way to search correct resources in social P2P scheme. In our scheme, P2P maintains interesting keyword management table to search resources more correctly. If a neighbor does not have a resource, P2P compares similarity with representative keywords of other peers. From the simulation results, we can conclude that our scheme is more efficient and faster than other P2P algorithms in searching resources.

Our future work is to get better comparison results with other schemes via simulations and to optimize our interesting keyword based P2P.

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