Session Based Protocol: Data Sharing in an Overlay System

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***Abstract*- Overlay network such a network in which no existence of any server. It is recommended research spot for network architecture. There are various applications which can be deployed on this architecture. Overlay network is more reliable and efficient for sharing data. There are a variety of approaches exists which need to improve the overlay system efficiency. In overlay network instead of a centralized server every node has equal potential and priority. Peer's age not fix in the overlay network node may leave or join network frequently. Paper addresses the problem of extremely temporary populations in unstructured and loosely structured peer-to-peer (P2P) systems. In existing system query strategy is based on flooding where every query propagated to all achievable nodes inside certain area of network. This approach faces the limitation of scalability. In this paper, a session based approach for query supply, cashing and duplication is discussed. The problem of high temporary node in unstructured and loosely structured in P2P system can be solved by session based approach.**

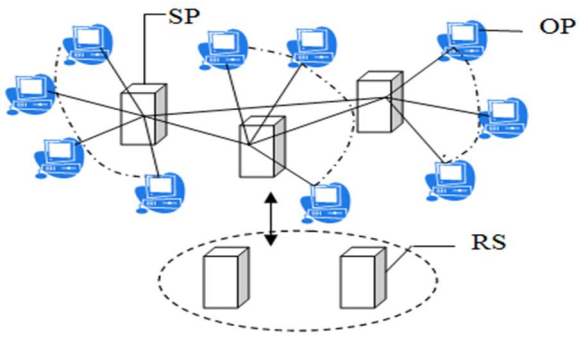
Keyword- P2P, Overlay Network, Cashing, Replication, Time Span Protocol

I. INTRODUCTION

In peer to peer network every node has autonomous nature. No one peer is controlled by a centralized server. Every node has same potential and priority for network. Due to its temporary member and sharing nature it attracted the attention of research community. A peer in peer to peer network may have a session of one minute or an hour**.** In such scenario implication of temporariness on the overall network's concert would noticeably depend on the height of node's investment in their adjacent nodes. The existence of messages processed by any node is equal to the degree of permanence of the node's neighboring set. Dynamicity of the peers' member affects the data sharing, level of duplication, cache's effectiveness and the reach and agreement rate of queries. Paper addresses the problem of highly temporary members in less structured P2P system. Time span of peers in widely-deployed system can be well modeled by a Pareto distribution [1]. In paper context, projected remaining session time of a peer is straight relative to current age of a peer.

We first express the advantages of considering time span in executive protocols i.e. how peers organize themselves in a P2P system in context of outcome end-application and in the terms of active and varied Internet environments. The session approach for executive protocols was first projected in [2]. This paper evaluates the reward of the planned approach in context of system performance in an active Internet test bed of 140 world-wide distributed Planet Lab nodes [3]. This is done using a set of executive protocol combined with a number presently adopted and planned query relate strategies, as well as methods for query sharing, caching and duplication. Our results will show that even simple session based overlays can considerably enhance system performance and also improve scalability of the system.

We then go further by applying similar ideas to query related strategies. During trace-driven simulation and broad region testing in Planet Lab we express the concert compensation of session based query associated strategies when layered over now employed organizational protocols as well as when used in arrangement with our future time span based organizational protocols. Our results will show that session based policy can generate over *2 to 5* times extra query hits than substitute strategies tentatively. While merely descriptive, the evaluated protocols and strategies noticeably show the reward of considering peers' age in designing scalable overlay system. Figure 1 shows a traditional less structured overlay network. SP represent the Super Peer node and OP is an Ordinary peer whereas Registered Server is represented by RS.



Rest part of this paper is proceeds as follows: Section 2 provides some literature survey and reviews associated work. Section 3 show session based protocol and discusses session organizational protocols and query related strategies. Section 4 describes our evaluation and future work. We conclude in Section 5.

II. RELATED WORK

An overlay network may be structured or unstructured based on its own organizational protocol. Node joins the system by contacting a set of peers already in the network in unstructured network [4, 5]. Peers describe the P2P network

overlay by connections with other, randomly chosen, peers. While organizational protocols for unstructured systems, such as Gnutella [6, 7], consider all peers have same potential. Protocol for unstructured systems; such as Gnutella v0.6 and KAZAA [8] usually describe a two level hierarchy distinguish between universal peers and super peers who have more resources [4, 5]. *Decentralized Unstructured Protocols (DUP)* and *Cross Decentralized Protocols (CDP) also referred.*

Here linked peers cooperate with each other exchanging different kinds of messages, most of which are broadcasted or back propagated. All other peers whom have connection with sender receive broadcasted communication. Back propagated messages are forwarded on an exact link on the reverse of the path taken by a connected message. In following subsection queries and response are discussed in detail. Further messages contain object transfer and cluster membership messages such as *Hi*, *Hello* and *bye*. *Hi* are used to find out hosts on the network. *Hi* will respond by *Hello* messages, containing information (such as link information and mutual resources) about the responding peer and about some others that peer aware about. *Byes* are elective messages used to inform the closing of connections.

A. CACHING, QUERY AND REPLICATION

Searching and query system is a key element of resource mutual P2P systems. Searching of any element based on its object identifier is relatively easy task in highly structured (DHT-based) systems. In unstructured overlay network the location of any object is independent of the system topology [10]. We studied some less structured system including recently used and other proposed techniques for query distribution, caching and replication. The most used and simplest query strategy is *flooding*, in which a query propagated to all peer within a certain range. There is lack of scalability in flooding based approach [11]. Lv et al [11] propose *k-random-walks*, in which query messages (walkers) are separately forwarded to arbitrarily selected peers at each hop in parallel mode; it removes the number of messages from the network.

In overlay network a number of improvements have been suggested. Adamic et al [12] suggest using random walk in power law topologies with walks partial toward high degree nodes. While this can significantly enhance query performance, it could also result in congested nodes. Some strategies for index caching also proposed for improving query performance, such as *Caching Path with termination (CPT)* and *Adjacent Caching with incremental Update (ACU).* In CPT index cache with each entry maintained by node in the system being a *(key, value) pair* [13]. Usually *value* in the pair is pointer to the hop having a replica of the object related with the parallel key [14, 15]. When a node receive a query message, node doesn't only check his own shared content, but also detects recent cache entries with matching keys. Node responded with the associated pair after a successful match. System performance can be improved in both DHT-based and less structured systems using CPT. Every hop maintains caches of metadata for all of its adjacent. According to CPT send a query hit in behalf of own or adjacent, ultimately query performance will be increases [16].

To enhance the performance of a system replication is a common approach when circulated systems need to spread in numbers of nodes and items in the system and circle of network. In P2P simply makes replicas of contents for replication strategies on the requesting peer, upon a successfully query/reply. Further than there is a number of positive replication strategies which increasing query hits have been planned. Various explicit replication strategies proposed by Cohen and Shenker [10] they originate square-root replication, which can be proficiently achieved by path replication, to be best possible.

B. TEMPORARY NODES AND P2P SYSTEMS

A lot of studies available of peers' participation and temporariness in overlay system [17, 18, 19, and 20]. Chu et al found a median peer session time 60 minutes by experimenting 17,125 hops throughout 60 hours. These results represent highly instability population and major time of day effects. Various works calculated session times by actively probing formerly collected TCP/IP addresses of peers following an approach that can only decide if a node is or not tolerant TCP connections in the requested port without distinctive what application is associated to it.

We propose a unique study of peers' session in the broad deployed Gnutella network (v0.6 [5]) with a supper peers node. To avoid possible dimension errors, each of our experiment tries to put an application level connection checking for specific Gnutella packet headers. Normally probable remaining session time of a peer is directly proportional to the session's current age. Proposed numbers of illustrative session based organizational protocol shows its performance advantage in terms of enhanced systems reliability by a trace driven simulation process. In this paper, we go ahead of those beginning results, reporting the benefits of the planned approach in conditions of application performance and in a dynamic Internet test bed. Onward, we follow session based ideas for query related strategies like query, replication and caching and show visible performance advantage of these strategies when layered over modern working organizational protocols as well as when used in grouping with our proposed session based protocols. Some correlated research efforts have concerned at the performance and maintenance charge of DHT based system in the face of churn. Even though initially aimed to non-DHT protocols, our time stamp based approach could be easily combined with some of the techniques projected in the literature to yield improved structurally churn flexible DHT systems. We plan to explore this as part of our future work.

III. SESSION BASED PROTOCOL AND STRATEGIES

In section paper presents few sessions based descriptive organizational protocols and query-related strategies. To have continuity and control, we first present an outline of one of the earlier proposed time span based protocol and describe its extension for less structured overlay systems. A number of lifespan-based, query-related strategies are also projected and discussed in detail. We close the section by outlining a trivial circulated protocol for peers' age detection.

A. ORGANIZATIONAL PROTOCOLS

The logic behind the projected organizational protocols is to dynamically increase the system's reliance on a node as the node's long term dedication to the population becomes clear. This can be achieved by simply giving preference to peers with probable longer session's times. Given the Used Better than New in Expectation nature of time span distribution [17], a peer's present age is a fair estimate of its session. The logic can be mutually applied together for unstructured and loosely structured protocols. As the definite number of received connections that a peer can acknowledge is commonly bounded, SDUP employs a weighted credit choice scheme that also suppose the peer's current session time and the present incoming connection slots which are available. We apply session based thoughts to loosely-structured network; where at highest layer of the network super peers are positioned and given greater farm duties to the community than common end peers. When setting up new connection with SDUP, super peers can give priority to older super peers while end peers could select, with higher possibility, for older super peers when deciding to which node to join. We use session based *CDP*, or *SCDP* to indicate this loosely structured, lifespan based, organizational etiquette.

B. QUERY-RELATED STRATEGIES

Existing query associated strategies can be simply modified to incorporate time span based ideas as with organizational protocol. We now explain in detail different illustrative session based strategies for query circulation, caching and replication.

Query distribution in the innovative *k-random-walks* query strategy [11], each visited node randomly selects the next peer where to precede the query walker. While offering good scalability, this purely blind approach is unaware to peers' characteristics or past history. This basic random walk strategy can be simply extended to provide priority to those peers with probable longer time span times when guiding the forwarding of a query walker. Relies on the weight that a peer's expected session time acts in the forwarding decision, a native algorithm could increase the possibility of collision between various walkers. Collisions will reduce the performance of the idea and can even result in the making of hotspots at old peers. For our estimation we assume a straightforward weighted probabilistic approach which has exposed to be highly efficient while avoiding the above mentioned problems.

Even though **Caching** is directly applicable, the efficiency of CPT in less structured overlay network is undecided, as various searches for the same aim may divert in paths than preceding ones, opposing the advantage of caching. Thus, we extend CPT to face a wide region around the path consequential which called A*rea Caching with Expiration (ACX).* In ACX, a peer directs a query hit message back to the client will also push the query hit entry to some of its adjacent caches. Pushing cache indexes with higher possibility to older peers can improve the number of queries responded based on these cached entries. Given the temporary of peer nodes, cached entries must be expired after reasonably short times to decrease the number of old ones. For this we can use a cache expiration technique based on similar session based approach the exile policy can think the probable age of the peer referred to in the cache entry in determining the maximum age of a given entry. We have establish this strategy to be considerably more effective than the uncomplicated approach of simply setting a constant maximum age for all cache entries and periodically eliminate those exceeding it.

An important role is played by **Replication** in improving the performance of queries. By duplicating files at some transitional peers along the query path, relevant queries can be answered in a more efficient way. The simplest form of practical replication leaves copies of the demanded object along the paths used by query or query hit communication. As with CPT caching, the effectiveness of this approach in less structured P2P systems is uncertain given that various searches for the similar object may take different paths than preceded ones. Consequently, we adjust the path replication approach slightly by putting copies of the requested objects on some adjacent of each peer along the query/query-hit paths; this strategy referred as *regional replication.* Regional replication can easily fit in time span based approach by choosing for nodes with longer estimated session times as objective recipients of object copies. These replicas would be more expected to stay online longer, potentially serving a large number of queries. As previously defined organizational protocols and query strategies we employ an age weighted, probabilistic idea to pick the target peers for replication. Obviously, a node could always restrain the number of replicas it is eager to host on behalf of others. Clearly, these descriptive lifespan based strategies could be openly working in original unstructured and loosely structured DUP and CDP systems, as well as in the projected session based SDUP and SCDP protocols described in the earlier subsection.

C. DETERMINING PEERS' AGE

The efficiency of the projected session based idea depends in part on the robustness of our session length estimators and the correctness of peers' age information. To improve the latter, we have intended a *lightweight distributed protocol for peers' age determination* based on earlier job on reputation [11, 12]. Suppose a system composed of mostly self interested peers. Prior to a given node can choose who it should effort concerning to, it must first decide the age of a set

of applicant peers. To this end, each peer in the system keeps path of other peers with whom it has communicated (through a connection request, a *Hi/Hello* or a query/reply exchange) and the time of their first and latest connections. When a given peer, wants to decide the age of a candidate peer , the next three stage protocol can be used:

Stage 1: Witness Collection: first desires froma list of the peers that has recognized the longest and with whom has connected in most recent times. Peers in this list potentially serve as witnesses of a peers' age.

Stage 2: Witness Sampling and Trimming: From the available list and in order to decrease the probability of collusion, first trims off future witnesses with doubtfully large interaction windows and then samples a subset of the outstanding peers to create the final observer list.

Stage 3: Collecting Testimonies and Determining Age: In the final phase we verifies the dealings times reported by straight connecting all peers in the final observer list and determines peer's age as a function like least or median of the collected testimonies, i.e. the verified interaction windows.

The protocol has a number of characteristics that improve its elasticity to dishonest. The age of a peer is not at all openly requested from the peer itself, but decided during the collected testimonies of arbitrarily selected witnesses. In addition, the trimming of outliers helps in decreasing the possibility of little cabals. Even though the value resolute by our protocol may not exactly match the real age of the peer in question, it is enough for our purposes as our protocols are not much interested in the actual age of a peer than in its relative superiority among other runner peers. We are currently evaluating the possible impact of judgment error of peers' seniority on the performance of time span based ideas.

IV. EVALUATION

We will estimate the advantage of the proposed lifespan based idea to both query related strategies and organizational protocols via simulations and broad area experiments in Planet Lab. We will evaluate this approach against currently employed and proposed strategies and organizational protocols. The aim of this evaluation is to decide the effectiveness of the proposed idea at improving system reliability and, finally, improving the performance of end application.

A. ORGANIZATIONAL PROTOCOL AND QUERY RELATED APPROACH

For evaluation we implement two simple random approaches organizational protocols are *Decentralized Unstructured Protocols (DUP)* and *Cross Decentralized Protocols (CDP) as* well as our session organizational protocols, *SDUP* and *SCDP*. We also implemented CPT, ACU and ACX for caching. For CPT and ACX, we put the highest number of object identifiers to 200 and the maximum number of node identifiers per object to 10. The session based ACX is indicated as *SACX*, else is denoted as *RACX*. The basic form of replication is denoted as SRep (Simple Replication). For Area Replication (ARep), *we use SARep and RARep* to denote its session and random based variants correspondingly. For both SARep and RARep, we put an higher bound on the number of replicas a peer can hold to be 10. Figure 2 define different acronyms for various protocols.

Organizational Protocol	Random	Session
Unstructured	DUP	SDUP
Loosely Structured	CDP	SCDP

DUP: Decentralized Unstructured Protocol
CDP: Cross Decentralized Protocol

Query Related Strategies	Random	Session
Query Strategy	RQuery	SQuery
Caching Strategy	RACX, CPT, ACU	SACX
Replication Strategy	RARep, SRep	SARep

RQuery, SQuery: Random and Session based k random walker
RACX, SACX: Random and Session based Area Caching with expiration
CPT: Caching path with termination
ACU: Adjacent Caching with incremental Update
RARep, SARep: Random and Session based Regional Replication
SRep: Simple Replication

Figure 2: List of organizational protocols and query related strategies and their acronyms.

B. METRICS

The performance of the projected approach is evaluated in terms of the improvement to query related tasks as three simple metrics as: Query Solution Time, Hits of Query and Query Satisfaction. *Query Solution Time* is the period between query sending and the receiving of the first respond. *Hits of Query Number* stands for quantity of query hits correlated with a given query. We also investigate the average query hit number for all queries issued during each simulation. *Query Satisfaction* [22] is the gain of queries achieving satisfaction, i.e. obtaining at least *n* query hits.

C. WIDE-AREA EXPERIMENTAL AND SIMULATION SETUP

All simulations are employed on event based simulator for overlay network with support for all relationship management associated functionalities as well as a array of query distribution, caching and replication mechanisms. We perform simulation with four of the 20 traces collected, four with a whole simulation time of 510,000 seconds, capturing the lifespan of 150,055 peers. At any instance throughout a simulation run, there are around 3,000 to 4,000 lively peers in the system.

For our broad area evaluation, we implemented session based protocols and strategies as extensions to an open

source Gnutella client [23], thus inheriting all the probable functionality of a classic P2P data sharing system. As mentioned former, we use random and session based *k random walk* instead of the novel flooding in Gnutella as query strategies. Our plan to run our system simulation using approximate 150 fix Planet Lab nodes, dispersed over the world. At any time through an experiment, the number of lively peers in the whole system ranges among 200 and 300, evenly mapped to the set of Planet Lab hosts. Peers' sessions are sampled from our composed traces. To guarantee that peers of the various protocols or strategies were uncovered to the same network conditions and host load as their complement for fair assessment, all experiments will run the compared configurations concurrently.

In simulation, except explicitly stated, we use per query four query walkers, with a TTL value of 20 for each walker. In the broad area, three walkers consisted by every query a TTL value of seven for each one query. Every dynamic peer issues a Query for every 600 seconds on average, both in simulation and in broad area evaluation.

D. SIMULATION RESULTS

1. ORGANIGATIONAL PROTOCOL

We first observe the benefits of a session based approach in organizational protocols. To better understand the effects of session based OP, the first three sets of simulations isolate the aid of caching and replication to query performance. We first calculate the advantage of this approach under plain replication (PRep) not including caching. We then show its benefits via two special caching strategies, CPT and ACU, respectively, but without replication. The last 4th set of simulation demonstrates results with both caching and plane replication (Prep and ACU) enabled. Simulations are mainly done in unstructured systems, followed by some loosely structured ones.

Figure 2 demonstrate the Cumulative Distribution Function (CDF) of query decision time and query hit number via plan replication (PRep) and without caching. The gain of a more constant P2P in SDUP is clear from graphs. Figure 2 define decreases of 50% to 70% in query resolution time with the session based SDUP in difference to DUP. We can observe that above 50% query can be solved in 0.5 seconds for SDUP where it consume 1 second to resolve the same percentage of queries for DUP. The session based protocol results in significantly better aggregated query hit number than DUP (57% more) and higher query fulfillment at various satisfaction stages.

Figure 4 demonstrate query performance of the session based, loosely structured SCDP system against the substitute CDP system. As the diagram shows, 50% of the queries can be resolved in about 0.45 seconds with SCDP, while they take over 1.3 seconds with CDP. SCDP has a query hit number of 9 for 80 percentile queries while CDP can only guarantee a value of 6. Clearly, session based organizational protocols can advantage loosely structured overlay systems in the comparable way as they advantage unstructured ones, soft faster query response times and higher query hit numbers.

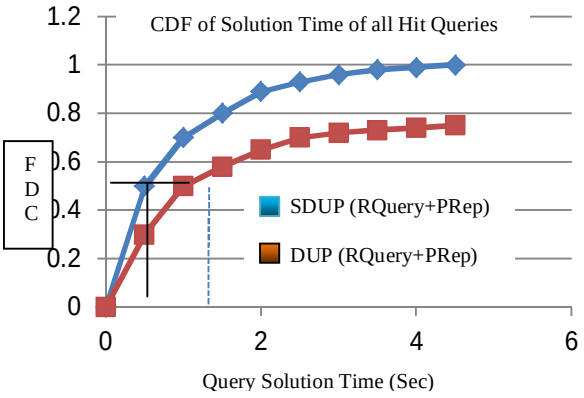


Figure 1 Query performance for DUP and SDUP with plane replication (PRep) and without caching.

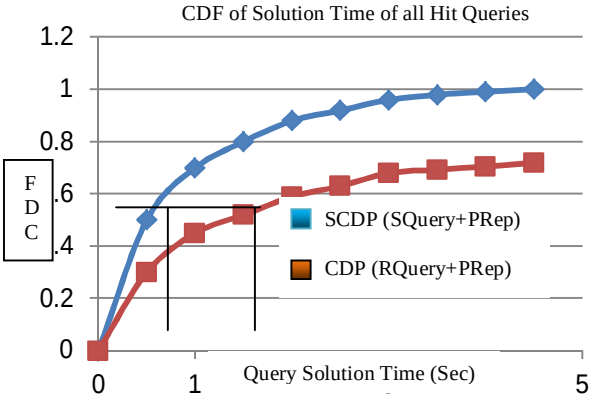


Figure 4. Query performance for SCDP and CDP with Plan replication (PRep) and without caching.

2. QUERY RELATED STRATEGIES

We now estimate the throughput of session based query associated strategies. We present, for unstructured overlay systems, how session based strategies can increase searching performance. Applying these strategies to loosely structured network yield even more important throughput, which we skip here due to space constraint.

We first show the advantage of employing session based thoughts only for the query strategy (SQuery). This belong to the set-up in which only implicit, plane replication (PRep) is used upon hit queries, while explicit replication and caching strategies are disabled. Note that this is the frequent case for presently deployed overlay systems. Figure 5 demonstrate the CDF of query solution time and query hit number at various stages for k random walk query strategy (RQuery) and our session SQuery, respectively. 50% of all queries can be answered in 0.4 seconds when using SQuery, where it consumes 0.8 seconds with RQuery. Also, there is a significant increase in median query resolution number while switching from RQuery to SQuery. In absence of caching or

explicit replication is existing in this scenario, the variation between the two can only be credited to query strategies themselves. SQuery walkers, i.e. random walkers biased in the direction of old peers, are more likely to run into peers with more shared objects, making possible to response queries more efficiently.

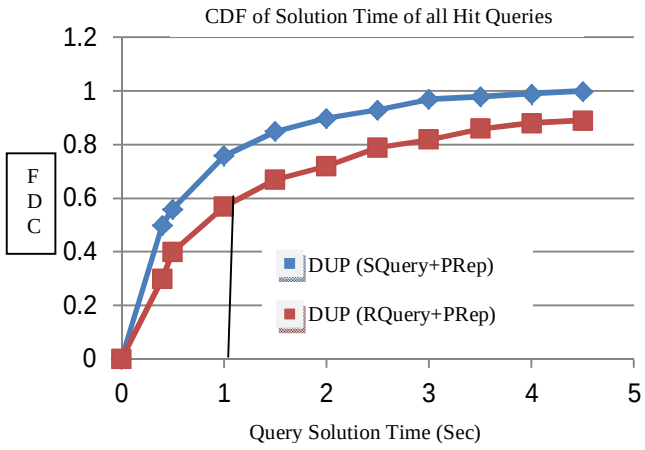


Figure 5. Query throughput for SQuery and RQuery using plane replication (PRep) and no caching.

V. CONCLUSION

This paper addresses the crisis of highly temporary nodes in unstructured and loosely structured overlay systems. Using a number of descriptive organizational protocols and query related strategies; we show trace-driven simulation and broad area experiment results that demonstrate the performance benefits of considering peers' expected session time as a key system element in the design of churn elastic overlay systems. The benefits of session based approaches are not bounded to control related traffic, but expand to applications, resulting in better query fulfillment and decision time, as well as system scalability significantly. Future work is simulating SQuery and RQuery using plane replication with caching.

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