ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Cooperative Caching for Efficient Data Access in Disruption Tolerant Networks

Vanaparthi Govinda Rao
P.G. Scholar (M. Tech),
Department of CSE,
Srinivasa Institute of Technology & Sciences,
Ukkayapalli, Kadapa, Andhra Pradesh.

K.Rajasekhar Reddy
Assistant Professor,
Department of CSE,
Srinivasa Institute of Technology & Sciences,
Ukkayapalli, Kadapa, Andhra Pradesh.

ABSTRACT:

Disruption Tolerant Networks (DTNs) are characterized by unpredictable node mobility, low node density and lack of global network information. Most of research efforts in DTNs focus on data forwarding; only limited work has been made on providing efficient data access to mobile users. Here we propose a novel approach to support cooperative caching in DTNs, which provides the sharing and coordination of cached data among multiple nodes and reduces data access delay. Our basic design is to intentionally cache data at a set of Network Central Locations (NCLs), which can be easily accessed by other nodes in network. An efficient scheme which ensures appropriate NCL selection based on a probabilistic selection metric and coordinates multiple caching nodes to optimize the tradeoff between caching overhead and data accessibility. Extensive trace-driven simulations show that our approach significantly improves data access performance compared to existing schemes.

Key words:

Disruption Tolerant Networks, Cooperative caching, Data Access, Network Central Location.

1. INTRODUCTION:

Disruption Tolerant Networks (DTNs), movable nodes connect to each other using opportunistic contacts. Due to the low node density and unpredictable node mobility, only intermittent network connectivity exists in DTNs, and the subsequent difficulty of maintaining end-to-end communication links makes it necessary to use "carry-andforward" methods for data transmission, which greatly impairs the performance of data access. In such networks,node mobility is exploited to let mobile nodes carry data as relays and forward data opportunistically when contacting others.It is to determine the appropriate relay selection strategy.

Although forwarding schemes have been proposed in DTNs there is limited research on providing efficient data access to mobile users, despite the importance of data accessibility in many mobile applications. The destination of data is, hence, unknown when data are generated. This communication paradigm differs from publish/subscribe systems in which data are forwarded by broker nodes to users according to their data subscriptions. Appropriate network design is needed to ensure that data can be promptly accessed by requesters in such cases. A common technique used to improve data access performance is caching, to cache data at appropriate network locations based on query history, so that queries in the future can be responded with less delay. Although cooperative caching has been studied for both web-based applications and wireless ad hoc networks, to allow sharing and coordination among multiple caching nodes, it is difficult to be realized in DTNs due to the lack of persistent network connectivity. First, the opportunistic network connectivity complicates the estimation of data transmission delay, and furthermore makes it difficult to determine appropriate caching locations for reducing data access delay. This difficulty is also raised by the incomplete information at individual nodes about query history. Second, due to the uncertainty of data transmission, multiple data copies need to be cached at different locations to ensure data accessibility. The difficulty in coordinating multiple caching nodes makes it hard to optimize the tradeoff between data accessibility and caching overhead. To efficiently support cooperative caching in DTNs. The basic idea is to by design cache data at a set of network central locations (NCLs), each of which corresponds to a group of mobile nodes being easily accessed by other nodes in the network. Every NCL is represented by a central node, which has high reputation in the network and is prioritized for caching data. Due to the incomplete caching buffer of central nodes, several nodes near a central node may be involved for caching, and ensure that popular data are always cached nearer to the central nodes via dynamic cache replacement based on query history.

II.LITERATURE SURVEY:

The primary focus of these mechanisms is to increase the likelihood of finding a path with limited information, so these approaches have only an incidental effect on routing metrics such as maximum or average delivery delay. In this paper, we present rapid, an intentional DTN routing protocol that can optimize a specific routing metric such as worst-case delivery delay or the fraction of packets that are delivered within a deadline. The key insight is to treat DTN routing as a resource allocation problem that translates the routing metric into per-packet utilities which determine how packets should be replicated in the system. In this paper, we rigorously prove that a finite domain, on which most of the current mobility models are defined, plays an important role in creating the exponential tail of the inter-meeting time.

We also prove that by simply removing the boundary in a simple two-dimensional isotropic random walk model, we are able to obtain the empirically observed power-law decay of the intermeeting time. We then discuss the relationship between the size of the boundary and the relevant timescale of the network scenario under consideration. Our results thus provide guidelines on the mobility modeling with power-law inter-meeting time distribution, new protocols including packet forwarding algorithms, as well as their performance analysis.We study data transfer opportunities between wireless devices carried by humans. We observe that the distribution of the intercontact time (the time gap separating two contacts between the same pair of devices) may be well approximated by a power law over the range [10 minutes; 1 day]. This observation is confirmed using eight distinct experimental data sets. It is at odds with the exponential decay implied by the most commonly used mobility models.

In thispaper, we study how this newly uncovered characteristic of human mobility impacts one class of forwarding algorithms previously proposed. We use a simplified model based on the renewal theory to study how the parameters of the distribution impact the performance in terms of the delivery delay of these algorithms. We make recommendations for the design of well-founded opportunistic forwarding algorithms in the context of human carried devices.

III. NETWORK MODEL :

The basic idea is to intentionally cache data only at a specific set of NCLs, which can be easily accessed by other nodes in the network. Queries are forwarded to NCLs for information access. The big picture of our proposed scheme is illustrated in Fig. 3. Each NCL is represented by a central node, which corresponds to a star. The push and pull caching strategies conjoin at the NCLs. The data source S actively pushes its generated data toward the NCLs, and the central nodes C1 and C2 of NCLs are prioritized for caching data. If the buffer of a central node C1 is occupied, data are cached at another node A near C1. Multiple nodes at a NCL may be involved for caching, and a NCL, hence, corresponds to a connected sub graph of the network contact graph G, as the dashed circles illustrated in Fig. 3. Note that NCLs may be overlapping with each other, and a node being involved for caching may belong to multiple NCLs simultaneously. A requester R pulls data by querying NCLs, and data copies from multiple NCLs are returned to ensure prompt data access. Particularly, some NCL such as C2 may be too far from R to receive the query on time, and does not act in response with data. In this case, data accessibility is determined by both node contact frequency and data lifetime.

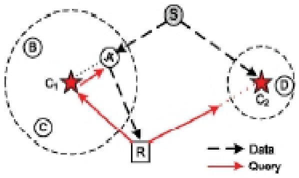

Fig 1.The big picture of intentional caching.

A. Network Central Location :

In this section, describe how to select NCLs based on a probabilistic metric evaluating the data transmission delay among nodes in DTNs; to validate the applicability of such metric in practice based on the heterogeneity of node contact pattern in realistic DTN traces.

B. Multihop Opportunistic Connection on Network :

The data transmission delay between two nodes A and B, indicated by the random variable Y, is measured by the weight of the shortest opportunistic path between the two nodes. In practice, mobile nodes maintain the information about shortest opportunistic paths between each other in a distance-vector manner when they come into contact.

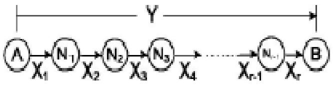

Fig.2. Opportunistic path

C. Caching scheme:

In this section, present cooperative caching scheme. The basic idea is to intentionally cache data at a set of NCLs, which can be promptly accessed by other nodes. This scheme consists of the following three components: 1. When a data source generates data, it pushes data to central nodes of NCLs, which are prioritized to cache data. One copy of data is cached at each NCL. If the caching buffer of a central node is full, one more node near the central node will cache the data. Such decision are by design made based on buffer conditions of nodes involved in the pushing process. 2. A requester multicasts a query to central nodes of NCLs to pull data, and a central node forwards the query to the caching nodes. Multiple data copies are returned to the requester, and optimize the tradeoff between data accessibility and transmission overhead by controlling the number of returned data copies. 3. Utility-based cache replacement is conducted whenever two caching nodes contact and ensures that popular data are cached nearer to central nodes.

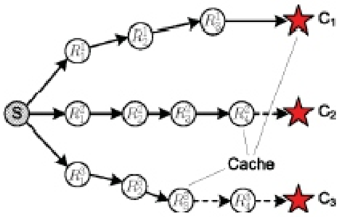

Fig.3. Determining caching location at NCLs

Such determination of caching location is illustrated in Fig. 5, where the solid lines indicate opportunistic contacts used to forward data, and the dashed lines indicate data forwarding stopped by node buffer constraint. Central node C1 is able to cache data, but data copies to C2 and C3 are stopped and cached at relays R24 and R33 , respectively, because neither C2 nor R34 Have enough buffers to cache data.

D .Queries:

While the central node C1 is able to return the cached data to R immediately, the caching nodes A and B simply reply to R after they receive the query from central nodes C2 and C3, respectively. The query broadcast finishes when query expires.

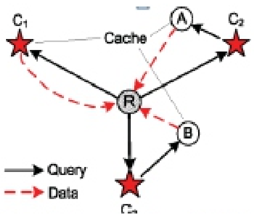

Figure 4. Pulling Data From The NCLs

Multiple data copies are replied to the requester from NCLs to ensure that the requester receives Data before query expires. However, only the first data copy received by the requester is useful, and all the others are essentially useless and waste network resources. The major challenge for solving this problem arises from the intermittent network connectivity in DTNs.

E. Ncl Load Balancing:

First, the central nodes cache the most popular data in the network and respond to the frequent queries for these data. Second, the central nodes are also responsible for broadcasting all the queries they receive to other caching nodes nearby. But, such functionality may quickly consume the local resources of central nodes that include their battery life and local memory. The selection may degrade the caching performance as illustrated in Fig 7. When the local resources of central node C1 are depleted, its functionality is taken over by C3. Since C3 may be far away from C1, the queries broadcasted from C3 may take a long time to reach the caching nodes A, and hence reduce the probability that the requester R receives data from A on time. From Fig. 7, it is easy to see that such performance degradation is caused by the existing data being cached at nodes near C1.

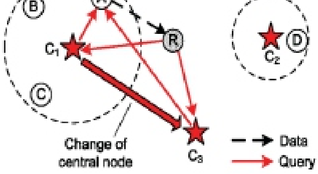

Fig.5. NCL load balancing

IV.RESULT:

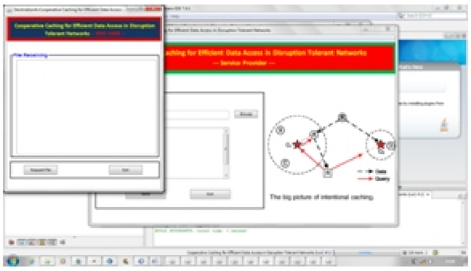

figure 6. end user-a in file receiving mode

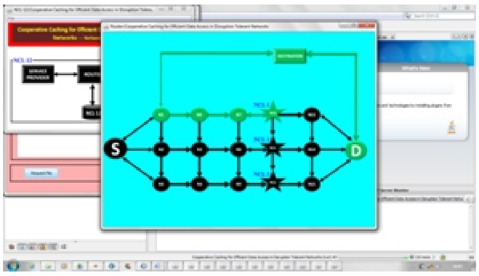

figure 7. router in the process of file processing

V. CONCLUSIONS:

In this paper, we propose a novel scheme to support cooperative caching in DTNs. Our basic idea is to intentionally cache data at a set of NCLs, which can be easily accessed by other nodes. We ensure appropriate NCL selection based on a probabilistic metric; our approach coordinates caching nodes to optimize the tradeoff between data accessibility and caching overhead. Extensive simulations show that our scheme greatly improves the ratio of queries satisfied and reduces data access delay, when being compared with existing schemes.

REFERENCES:

[1] A. Balasubramanian, B. Levine, and A. Venkataramani, “DTN Routing as a Resource Allocation Problem,” Proc. ACM SIGCOMM Conf. Applications, Technologies, Architectures, and Protocols for Computer Comm., pp. 373-384, 2007.

[2] C. Boldrini, M. Conti, and A. Passarella, “ContentPlace: Social- Aware Data Dissemination in Opportunistic Networks,” Proc. 11th Int’l Symp. Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM), pp. 203-210, 2008.

[3] L. Breslau, P. Cao, L. Fan, G. Phillips, and S. Shenker, “Web Caching and Zipf-Like Distributions: Evidence and Implications.” Proc. IEEE INFOCOM, vol. 1, 1999.

[4] J. Burgess, B. Gallagher, D. Jensen, and B. Levine, “MaxProp: Routing for Vehicle-Based Disruption-Tolerant Networks,” Proc. IEEE INFOCOM, 2006.

[5] H. Cai and D.Y. Eun, “Crossing over the Bounded Domain: From Exponential to Power-Law Inter-Meeting Time in MANET,” Proc. ACM MobiCom, pp. 159-170, 2007.

[6] P. Cao and S. Irani, “Cost-Aware WWW Proxy Caching Algorithms,” Proc. USENIX Symp. Internet Technologies and Systems, 1997.

[7] A. Chaintreau, P. Hui, J. Crowcroft, C. Diot, R. Gass, and J. Scott, “Impact of Human Mobility on Opportunistic Forwarding Algorithms,” IEEE Trans. Mobile Computing, vol. 6, no. 6, pp. 606-620, June 2007.

[8] P. Costa, C. Mascolo, M. Musolesi, and G. Picco, “Socially Aware Routing for Publish-Subscribe in Delay-Tolerant Mobile Ad Hoc Networks,” IEEE J. Selected Areas in Comm., vol. 26, no. 5, pp. 748- 760, June 2008.

[9] E. Daly and M. Haahr, “Social Network Analysis for Routing in Disconnected Delay-Tolerant MANETs,” Proc. ACM MobiHoc, 2007.

[10] H. Dubois-Ferriere, M. Grossglauser, and M. Vetterli, “Age Matters: Efficient Route Discovery in Mobile Ad Hoc Network Using Encounter Ages,” Proc. ACM MobiHoc, pp. 257-266, 2003