

Replication of data associated with locations in ad hoc networks

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1. Introduction

It is difficult to retain accessibility to data on other hosts in ad hoc networks because of disconnections caused by movements of hosts. This fact affects the practical use of ad hoc networks. When important data are operated on ad hoc networks, it is demanded to retain accessibility to the data from users even if there are disconnections between mobile hosts. Hara[1] has proposed some methods for allocating replicas on ad hoc networks for achieving high accessibility to data objects shared by multiple hosts. The methods are based on an assumption that all hosts on the network know the probabilities of data access to each object and the probabilities do not change.

In this paper, we handle a case that the probability of data access from each host change with time and its location. We propose a method to enhance the accessibility to data that are associated with locations and used frequently by hosts that are close to the location. We assume data object is accessed by geocast. Such kind of data will be used in personal navigation systems, systems handling virtual objects overlaid on to the real world like *Space Tag* and cooperative work for disaster relief etc.

2. Skip copy method

Our method, *Skip Copy (SC) method*, is based on replications of data objects. The features of the method are, (i) the locations of mobile hosts and the locations associated with data objects are used to arrange the replicas of the data at places where they are frequently used, (ii) dynamic rearrangement of replicas to keep the location of the replicas even when mobile hosts move, (iii) using hop count from a host that generated a original data object to hosts that store the replicas of data objects to control the redundancy of the replicas. If a host generates a data object, it disseminates the replicas like Fig. 1(a). The replicas are rearranged when the replicas are forwarded to a requesting host (Fig. 1(b)). By using this method, the replicas of data objects are distributed sparsely around the location where it is associated, and they stay near the location even hosts that have the replicas move about.

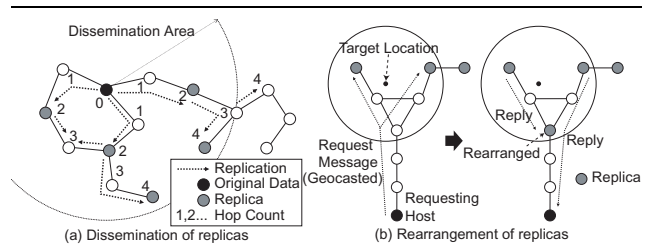


Figure 1. SC Method

We evaluated the effect of SC method by simulations that dozens of mobile hosts with limited storage size move around and exchange data related to locations. In the simulation, each host generates data object related data when it approaches data source and distribute the replica. If the storage of mobile a host becomes full, the replica of least recently used data with longer distance from the original location is purged. The behavior of MAC layer protocol was neglected in the simulations. The results showed that the access success ratio to data was large while the redundancy of replicas is small. Especially, the effect of rearrangement of replicas was large.

3. Conclusion

We proposed *SC method*, a method to distribute replicas of data associated with locations to mobile hosts in an ad hoc network. It achieves high access success ratio to the data with small redundancy of the replica. The analysis of the effect of MAC layer protocol and considering the density, speed, direction of nodes remain for future work.

References

- [1] T. Hara, "Effective replica allocation in ad hoc networks for improving data accessibility," in proc. of IEEE Infocom'2001, Vol.3, pp.1568-1576, 2001.