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# A NOVEL ASYMMETRIC COOPERATIVE CACHE APPROACH FOR MAC BASED WIRELESS P2P NETWORKS

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**ABSTRACT:-**

The cooperative cache can improve the system performance such as ad hoc networks, implementation issues unanswered. We are going to study on the effects of different MAC layers and the performance of cooperative will be cache is specified. It is very easy to access file from a nearby live storage node that holds data. So our results show that the asymmetric Cooperative cache schema provides the data with less amount of delay time, the asymmetric approach can significantly reduce the data access delay compared to the symmetric approach due to data pipelines.

Keywords—Wireless networks, P2P networks, cooperative cache, asymmetric approach.

## INTRODUCTION

Wireless P2P networks, such as ad hoc network, mesh networks, and sensor networks, have received considerable attention due to their potential applications in civilian and military environments such as disaster recovery efforts, group conferences. Most of the previous researches in ad hoc networks focus on the development of dynamic routing protocols that can efficiently find routes between two Communicating nodes. Although routing is an important issue in ad hoc networks, other issues such as information (data) access are also very important we use the following example to motivate our research.

**Example 1:** a wireless P2P network may consist of several commanding officers and a group of soldiers. Each officer has a relatively powerful data center, and the soldiers need to access the data centers to get various data such as the detailed geographic information, enemy information, and new commands. The neighboring soldiers tend to have similar missions and thus share common interests. If one soldier has accessed a data item from the data center, it is quite possible that nearby soldiers access the same data some time later. It will save a large amount of battery power, bandwidth, and time if later accesses to the same data are served by the nearby soldier who has the data instead of the far away data center. As another example, people in the same residential area may access the Internet through a wireless P2P network, e.g., the Roof net. After one node downloads a MP3 audio or video file, other People can get the file from this node instead of the far away Web server. Through this example, we can see that if nodes are able to collaborate with each other, bandwidth and power can be saved, and delay can be reduced [27].

Through these examples, we can see that if nodes are able to collaborate with each other, bandwidth and power can be saved, and delay can be reduced. Actually, cooperative caching [5], [16], [23], [24], which allows the sharing and coordination of cached data among multiple nodes, has been applied to improve the system performance in wireless P2P networks. However, these techniques [5], [16], [23], [24] are only evaluated by simulations and studied at a very high level, leaving many design and implementation issues unanswered.

There have been several implementations of wireless ad hoc routing protocols. In [22], Royer and Perkins suggested modifications to the existing kernel code to implement AODV. By extending ARP, Desilva and Das [7] presented another kernel implementation of AODV. Dynamic Source Routing (DSR) [12] has been implemented by the Monarch project in FreeBSD. This implementation was entirely in kernel and made extensive modifications in the kernel IP stack. In [2], Barr et al. addressed issues on system-level support for ad hoc routing protocols. In [13], the authors explored several system issues regarding the design and implementation of routing protocols for ad hoc networks. They found that the current operating system was insufficient for supporting on-demand or reactive routing protocols, and presented a generic API to augment the current routing architecture. However, none of them has looked into cooperative caching in wireless P2P networks.

Although cooperative cache has been implemented by many researchers [6], [9], these implementations are in the Web environment, and all these implementations are at the system level. As a result, none of them deals with the multiple hop routing problem and cannot address the on-demand nature of the ad hoc routing protocols. To realize the benefit of cooperative cache, intermediate nodes along the routing path need to check every passing-by packet to see if the cached data match the data request. This certainly cannot be satisfied by the existing ad hoc routing protocols.

In this paper, we present our design and implementation of cooperative cache in wireless P2P networks. Another major contribution of this paper is to identify and address the effects of data pipeline and MAC layer interference on the performance of caching. Some researchers have addressed the effects of MAC layer interference on the performance of TCP [10] and network capacity [17].

**Cooperative Caching Schemes**

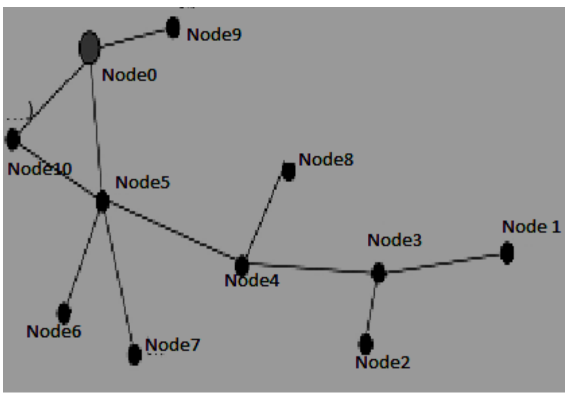


Fig : A Wireless P2P network.

## DESIGN AND IMPLEMENTATION OF COOPERATIVE CACHING

In this section, we first present the basic ideas of the three cooperative caching schemes proposed in [24]: Cache Path, Cache Data, and Hybrid Cache.

**Cooperative Caching Schemes**

Figure illustrates the Cache Path concept. Suppose node $N_1$ requests a data item from $Node_0$. When $Node_3$ forwards $d_i$ to $Node_1$, $Node_3$ knows that $Node_1$ has a copy of the data. Later, if $Node_2$ requests $d_i$ $Node_3$ knows that the data source $Node_0$ is three hops away whereas $Node_1$ is only one hop away. Thus, $Node_3$ forwards the request to $Node_1$ instead of $Node_4$. Many routing algorithms (such as AODV [20] and DSR [12]) provide the hop count information between the source and destination. Caching the data path for each data item reduces bandwidth and power consumption because nodes can obtain the data using fewer hops. However, mapping data items and caching nodes increase routing overhead, and the following techniques are used to improve Cache Path's performance.

Node not record the path information of all passing data, records the data path when it is closer to the caching node than the data source. For example, when $N_0$ forwards $d_i$ to the destination node $Node_1$ along the path $Node_5$ - $Node_4$ - $Node_3$, $Node_4$ and $Node_5$ won't cache $d_i$ path information because they are closer to the data source than the caching node $Node_1$. In general, a node caches the data path only when the caching node is very close. The closeness can be defined as a function of the node's distance to the data source, its distance to the caching node, route stability, and the data update rate. Intuitively, if the network is relatively stable, the data update rate is low, and its distance to the caching node is much shorter than its distance to the data source, then the routing node should cache the data path.

Cache Path and Cache Data can significantly improve system performance. Analytical results [24] show that Cache Path performs better when the cache is small or the data update rate is low, while Cache Data performs better in other situations. To further improve performance, we can use Hybrid Cache, a hybrid scheme that exploits the strengths of Cache Data and Cache Path while avoiding their weaknesses. Specifically, when a node forwards a data item, it caches the data or path based on several criteria discussed in [24].

## CONCLUSION

We presented our design and implementation of cooperative cache in wireless P2P networks, and proposed solutions to find the best place to cache the data. In our asymmetric approach, data request packets are transmitted to the cache layer on every node; however, the data reply packets are only transmitted to the cache layer on the intermediate nodes which need to cache the data. This solution not only reduces the overhead of copying data between the user space and the kernel space, but also allows data pipeline to reduce the end-to-end delay. We evaluate our design for a large-scale network through simulations developed a prototype to demonstrate the advantage of the asymmetric approach. Since our prototype is at a small scale, we scale network through simulations.

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