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Distributed Cache Invalidation Method using Extended Adaptive Time to Live Mechanism for Cache Consistency in Wireless Mobile Network

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Abstract: ***DCIM is a Distributed Cache Invalidation Method is used for maintaining cache consistency in wireless mobile network. DCIM is analysed for assessing delay time and bandwidth gain and compared for polling time. DCIM is a client based cache consistency schemes for caching data in wireless mobile network. DCIM is also used as a pull based algorithm for implementing Time to live, piggybacking and prefetching. An adaptive time to live (ATTL) For cache maintenance an adaptive TTL mechanism is used in DCIM that has update rates of data sources to update cache, where expired TTL values is grouped in validation requests rates are prefetched from the server. Existing system has used an adaptive TTL mechanism which contains some limitations like maximum request time, degraded system performance due to which the speed of communication reduces and data received is not reliable. Here the cache maintenance will be doing using EX-ATTL mechanism which will provide hash table for cache invalidation between each 1-hop distance node to data cache node. In this paper all this mechanism will reduce the overhead of the cache node to increase the speed of communication. This proposed mechanism will also reduce the request data delay time due to which the system performance get improved and will provide a reliable data.***

Keywords: Server, Access point, Cache maintenance, Query directory, DCIM, AODV, TTL, Request node, Intermediate nodes.

1. Introduction

In today's world scenario in mobile ad-hoc network mobile device is the building blocks which is essential for data caching because it increases the ability of the system device i.e. mobile device to access desired data and to improve system performance. Previously it is designed that cache consistency consists of three categories such as 1. Pushed based, 2. Pull based and 3. Hybrid based approach where pushed based approach is the server based while pull based approach is the client based and hybrid based approach is the combination of both client based and server based approach. Hybrid based approach mechanism pushes the server and updates the client pull based. In cache consistency mechanism architecture various cache nodes are used to cache the data from various devices. It is used to access the data and send the query from client node. The major issue for cache consistency for maintenance of data consistency is between client and server in mobile network. So many algorithms are used for cache consistency to increase the probability of serving the cache data to the server which is identical. DCIM is a Distributed Cache Invalidation Method which is a pull based approach and client based mechanism for implementing adaptive time to live (ATTL) mechanism for piggybacking, prefetching and also provides strong consistency in mobile network.

TTL is time to live mechanism which is a pull based approach algorithm. where TTL values are stored in the form of values which is denoted by data ad 'd', time as 't'. TTL mechanism is popular for it simplicity, flexibility for assigning the values to individual data. If the TTL values assigns to individual data end to zero then that data will get discarded and same process will have to follow again due to this the delay time get increased.

Ex-ATTL mechanism is an extended adaptive time to live mechanism which is used in hybrid approach. But DCIM is a client based approach so this mechanism is to be used in client based approach. Extended adaptive time to live mechanism is the mechanism in which 1 hop distance nodes are used to maintain a cache node and maintain a hash table respectively. Ex-ATTL mechanism increases the throughput of DCIM, increases the system performance, reduces the delay time, also reduces latency and jitter time of DCIM.

Here an Extended Adaptive time to live mechanism is used to solve all the major issues of TTL and ATTL mechanism in pull and push based approach.

2. Problem Definition

In Distributed cache Invalidation Method (DCIM) Fixed TTL take a additional process time for cache invalidation due to which maximum delay time occurs and the speed of communication from client to server is not proper due to which an reliable data is not being received. ATTL mechanism used is slow process to send the data due to which a Cache nodes contains an overhead.

3. Modules Required

1. DCIM using TTL mechanism:
Distributed Cache Invalidation Method (DCIM) is a client based approach used for catching data items. DCIM is a pull-based algorithm containing various techniques like Time To Live (TTL), prefetching, piggy backing etc. In this module a Time to Live mechanism is used for cache consistency. TTL mechanism provides a count value to every node in the network. Request Data will be sent from the client request node to the nearby node using TTL mechanism. As data get passed from one node to another the countdown value will

get decreased by one. If the value decreased till zero then automatically the request data will get discarded and again request data has to be send due to which request time required will be large.

2. DCIM using ATTL mechanism:
Distributed Cache Invalidation Method (DCIM) is a client based approach using Adaptive Time To Live mechanism were adaptive time to live mechanism is used for validation and invalidation for cache maintenance. ATTL works same as that of TTL mechanism. The request delay time of sending data from client node towards access point is large as same that of TTL mechanism. Pull Based algorithm is used in order to implement Adaptive Time to live (ATTL) mechanism. As in ATTL mechanism an adaptive values are assigned in place of time to live values by prefetching, piggybacking etc. It is completely client based approach assigned in order to approach delay time, system performance, latency and throughput.

3. DCIM using Ex-ATTL mechanism.
Distributed Cache Invalidation Method (DCIM) using Extended Adaptive Time to live (Ex-ATTL) mechanism. Ex-ATTL mechanism is used to overcome the problem of TTL and ATTL mechanism. Ex-ATTL mechanism cuts the delay by 3 factor and maintain the hash table to improve the system performance. Hash table is maintain by Ex-ATTL for maintaining the cache consistency due to which system performance will increase, delay time get reduces, throughput will get increased, jitter will also get decreased and latency will also get decreased.

Ex-ATTL is the advanced mechanism than that of TTL and ATTL mechanism. All the limitations of TTL and ATTL mechanism is to be solved by using Ex-ATTL mechanism.

RESEARCH METODOLOGY

Cache Maintenance by Distributed cache Invalidation Method with Extended Adaptive Time to live mechanism will be used in order to overcome the drawback of Adaptive Time To live mechanism used in distributed cache invalidation method in Wireless Mobile Network. Extended Adaptive Time to Live mechanism is more beneficial than adaptive time to live mechanism as it cut the query delay by a factor of 3 and throughput compared to adaptive time to live get double. In extended adaptive time to live mechanism 1-hop distance nodes to data cache node maintain a hash table for cache invalidation.

Moreover the request delay time will get reduced due to which the speed of communication get faster as compared to Adaptive time to live mechanism. Ex-ATTL mechanism reduces the overhead of cache computing and will improve the performance of wireless mobile network due to which we will get a reliable data with less delay time.

4. DCIM Architecture

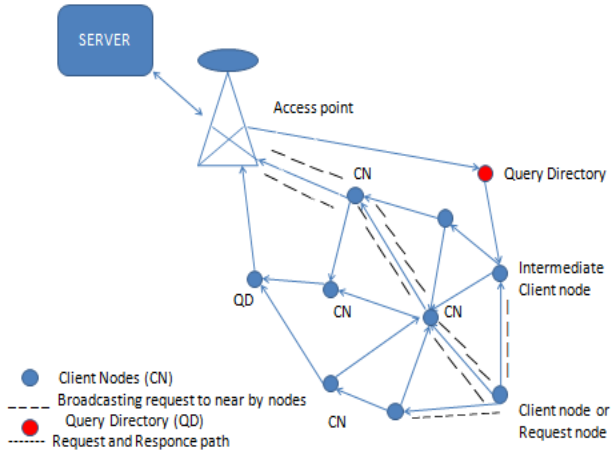


Figure 1: DCIM architecture using Ex-ATTL mechanism

The above figure 1 shows the architecture of DCIM using Ex-ATTL mechanism. This figure shows that how an extended adaptive time to live mechanism works in DCIM method. It shows that the client node or request node send the request by broadcasting the request to the nearby nodes, then the nearby nodes will update the request and will pass the request to their nearby nodes and by using AODV routing protocol they will form one route to send the request towards the access point. After receiving the data access point will start doing the communication with the server. Server will give response to that request send by the client node.

The response generated by the server will reach to the client node by the same path from where the request has been send. Due to this the delay time will get reduce, latency will get reduce and throughput will get increased and jitter time will also get reduce.

5. Proposed Plan of Work

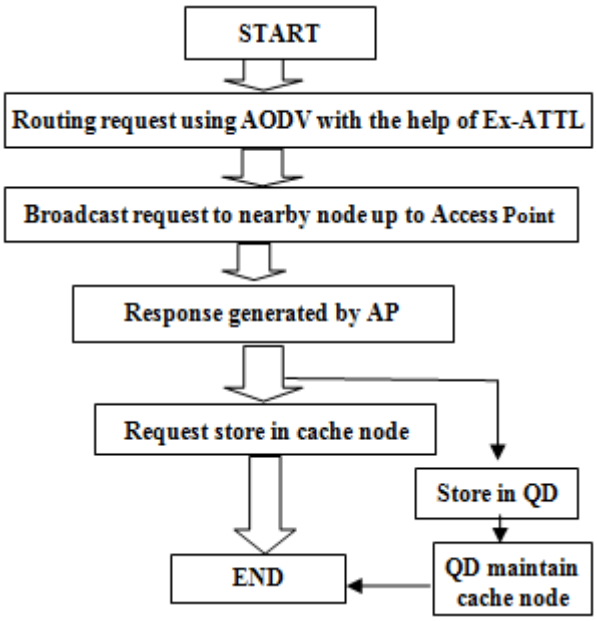


Figure 2: Our Proposed work plan

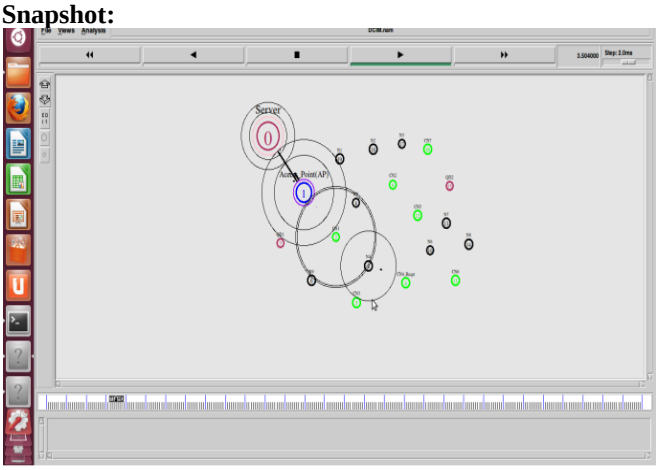
The above figure 2 shows the proposed plan work of DCIM method. This proposed plan show that how extended adaptive time to live mechanism work with DCIM method. Here it shows that routing request is send to the nearby nodes by using AODV routing protocol with the help of Ex-ATTL mechanism. By using Ex-ATTL mechanism the client node will broadcast its request to the nearby nodes up to the access point. A route will form with the help of AODV routing protocol. After receiving the request from client nodes access point will start doing communication with the server. Server will give response to the request generated by the client. Response generated by server will get stored in the client node. Query directory will also store the response generated by server, Query directory will also maintain the cache node.

1. FIRST MODULE: DCIM Communication Environment.

In the first module it shows that in the NS-2 environment some client nodes are used each client nodes has its own Query directory. A Query directory is used in the DCIM approach to maintain the query in order to maintain cache consistency.TTL mechanism is used in query directory to maintain the hash table or query table and to update the query in the table. In this module it is shown that the client node send a request to the nearby node by broadcasting the request to the nearby surrounding nodes. Query directory will update the request in the query directory.

By broadcasting the request the message will be send towards the access point by finding the shortest path by using AODV routing protocol. The request will be send to the server from the access point. The response will be send from the server to the access point and from the access point towards the client node by using the same shortest path.

Snapshot:



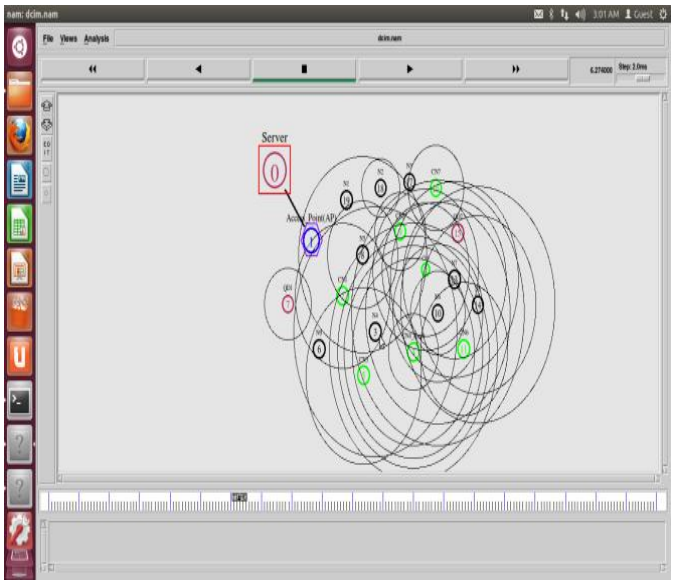
DCIM Communication Environment

2. SECOND MODULE: DCIM using Time To Live (TTL) mechanism.

In the first module DCIM communication environment is shown where the request is send from request node towards access point and from access point towards server is used while transmitting the data for client node to server node where an overhead node is formed and due to which the performance of the system get reduces.

In the second module DCIM using TTL mechanism is shown i.e. a TTL mechanism is used while transferring the data from request node towards intermediate nodes and from intermediate nodes towards access point and from access point towards server. In DCIM it states that for cache invalidation each 1-hop is performed from a distance nodes to the data cache node for cache maintenance.

Snapshot:



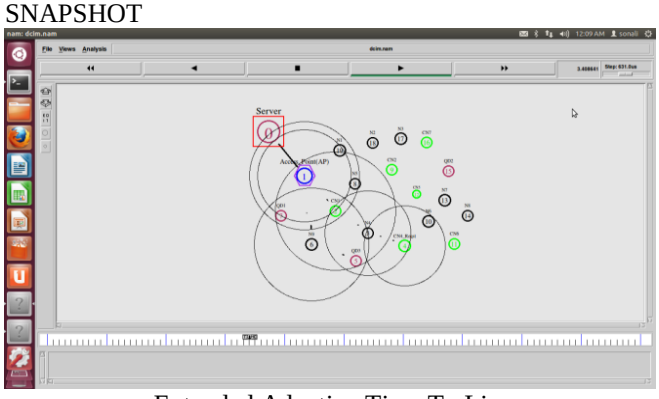
DCIM using Time To Live (TTL) mechanism

3. THIRD MODULE: Extended Adaptive Time To Live (Ex-ATTL) Mechanism

In the Third module i.e. an Ex-ATTL mechanism is used where for cache invalidation each 1-hop is performed from a distance nodes to the data cache node for cache maintenance.

The main advantage of Ex-ATTL from TTL mechanism is that it reduces the overhead of the intermediate node. It will also reduce the request delay time, avoid stale information and provide reliable data. For cache invalidation a hash table is maintain for cache maintenance to avoid the overhead of the intermediate nodes and to improve the system performance. The benefits of Ex-ATTL is that it cut the delay by a factor of 3 means Delay/3. Due to which the delay time get reduces and throughput increases and propagation ratio also get improved.

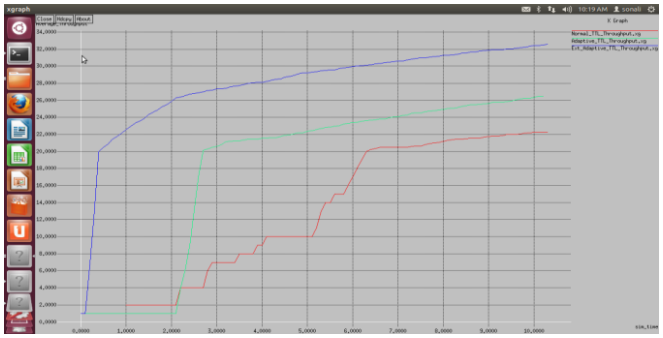
SNAPSHOT



Extended Adaptive Time To Live

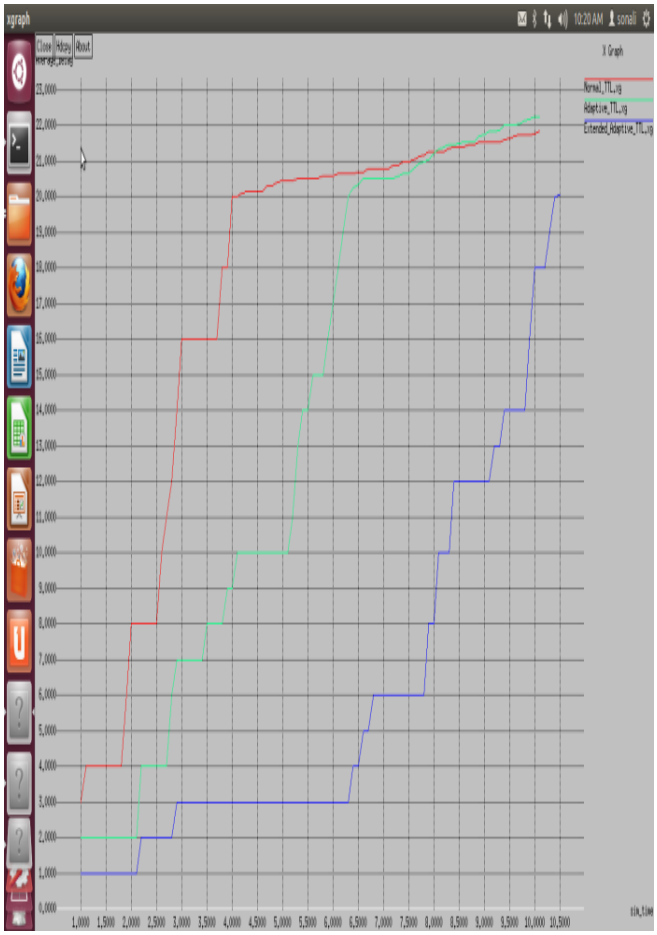
6. Comparison of Parameters as a Result Analysis

1. Throughput graph:
The graph shown below is the graph of throughput where it shows that the throughput required for Ex-ATTL is large as compared to TTL and ATTL mechanism



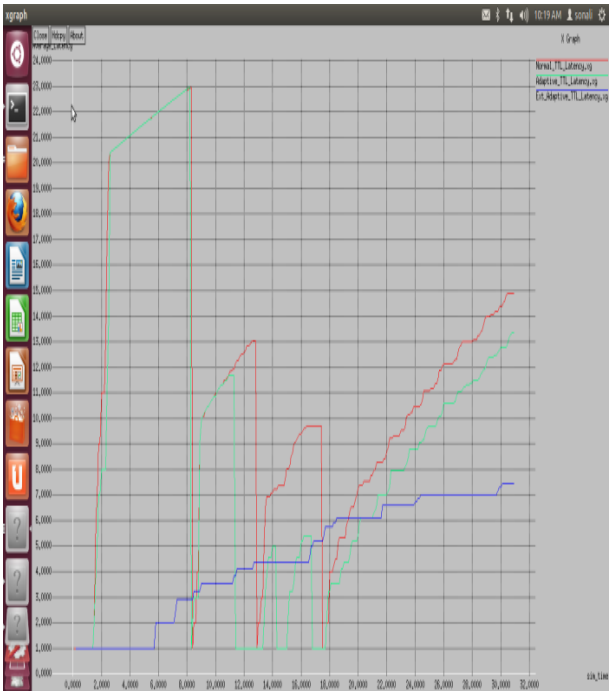
Comparison of Throughput for TTL, ATTL and Ex-ATTL mechanism

2. Delay Graph
The graph shown below is the graph of delay time where it shows that the delay time required for Ex- ATTL is less as compared to TTL and ATTL mechanism.



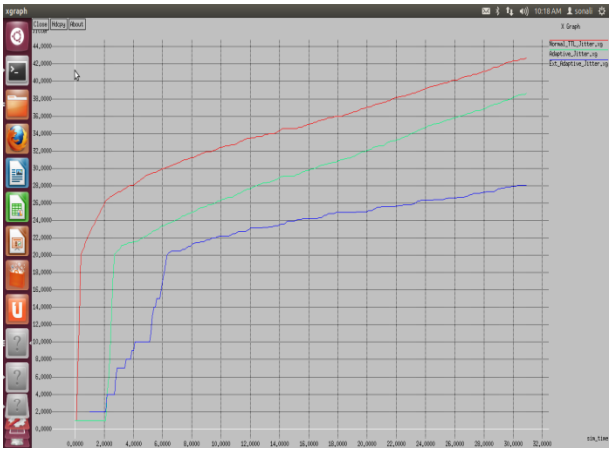
Comparison of delay time for TTL, ATTL and Ex- ATTL mechanism

3. Latency Graph:
The graph shown below is the graph of latency where it shows that the latency required for Ex-ATTL is less as compared to TTL and ATTL mechanism.



Comparison of latency for TTL, ATTL and Ex-ATTL mechanism

4. Jitter Graph:
The graph shown below is the graph of jitter where it shows that the jitter time required for Ex-ATTL is less as compared to TTL and ATTL mechanism.



Comparison of Jitter for TTL, ATTL and Ex-ATT mechanism

7. Case Study

In the present study, DCIM has used an ex-ATTL mechanism to overcome the problem of delay time, large latency, less throughput and large jitter which are the main issues in TTL and ATTL mechanism. This all problems are solved by using an Extended Adaptive Time To Live mechanism which has increased the throughput of the DCIM, reduces the delay time, reduces the latency and also reduces the jitter time which works same as that of the delay time. An Extended

Adaptive Time To Live mechanism has cut the delay time by 3 factorial other than that of TTL and ATTL mechanism.

8. Conclusions

We can say that for DCIM a validation and invalidation of data is done in the DCIM mechanism. An Extended adaptive time to live mechanism is used instead of time to live mechanism and adaptive time to live mechanism which contains the drawback of large delay time, low latency less throughput and less jitter time. This drawbacks of TTL and ATTL mechanism is solved by Extended adaptive time to live mechanism which cuts the delay time by a factor of 3 and maintain a hash table, it reduces the latency and jitter time and it increases the throughput of the DCIM mechanism. In order to get a quick response from server side an extended adaptive time to live mechanism is used to increase the system performance and get a reliable data.

9. Future Work

In future we can secure the request and response data by using security in DCIM techniques. A cryptography techniques can be used for securing the data while transferring from client node toward server and while generating the response from server towards the client nodes.

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