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D²RCR-Dynamic Distributed Route Level Content based On-Body Routing in Distributed Cloud Environment

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Abstract

Objectives: Human area network is one of the hot key research domains in the area of IEEE 802.15.6 standard. In the world of mobility, end user requires high sophistication and easy data access. This leads to heavy traffic within the gadgets. Hence to overcome these problems a novel route model is proposed. **Methods/Statistical Analysis:** This paper presents a route level content based store-and forward packet routing algorithm for Wireless Human Area Networks in distributed cloud environment. **Findings:** A prototype WHAN has been built for symbolizing on-body topology disconnections in the presence of ultra-short range wireless links (Cloud), volatile RF dilution, and humanoid motion. A route level content based store-and forward packet routing protocol is then developed for optimistic dynamic routing algorithm. Here, an Adaptive-point framework is created within the Cloud architecture, targeting to deliver reliable routing service for WHAN-inter body communication, where each HAN node functions as a mobile service node and predicts its future locations by generating Adaptive point messages, which describe the route of the node's movement. Semi-cloud module in cloud collects the Adaptive point information and makes decision for inter communication WHAN nodes. The proposed methodology reveals the globally optimized routing path in terms of message delivery and protocol constraint. The performance of the proposed model has been evaluated and experimental results reveal the improvement of routing problem in WHAN. **Application/ Improvements:** This method is applicable in packet data transmission for the wireless cloud environment.

Keywords: Cloud Computing, HAN Protocol, Mobile Computing, On-Body Communication, WHAN

1. Introduction

The database in the cloud environment requires rapid, effective and enhanced routing. Wireless Human Area Network protocol relies on Cloud computing methodology for global interaction for communication and communication channel establishment, effectively utilizes the model by which it interacts with, on a demand network access to a shared environment of configurable computing resources (for example networks, high end smart device protocols, storage application and models) that can be under rapid growth and released with nominal effort of management or service provider interaction[1-3]. The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units), our major deployment model for cloud environment is private cloud (i.e., it may be owned by an organization or by a third party vendors)[4-8]. A wireless network (Ad-hoc, Infrastructure, Sensor Networks, WHAN and WBAN) has great demand ranging from home appliances to defence field communication applications, where infra structured networks are often impossible. It may also provide valuable communication system for moving vehicles in a city. Wireless communication plays a vital role in communication as well as information sharing. For example, WLAN can be used widely in corporate sector and other working areas in which wired circumstances is entirely reduced and freed[9-13].

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2. HAN in Cloud Environment

Human Area Network (HAN) is one of the highly sophisticated protocols used for Human to Human communication[14,15]. Generally, multi-hop nature of Wireless Human Area Networks makes it impossible to reliably perform tightly synchronized configuration updates for all nodes. This means that, for some period of time, the network could be in an inconsistent state. In cloud environment packet transferring is reliable at high range while in low range it is very difficult to transfer packets within the nodes,since all nodes are in mobility. Hence our proposed methodology is adapted for reliable communication. The proposed routing scheme can be adapted to any cloud based routers for effective routing within the context.

3. Store and Forward Protocol Mechanism

To perform reliable packet delivery in the both plane network oriented as well as in cloud based, store and forward mechanismsare used. Initially all the nodes are flooded with the request and local information's are shared effectively in all nodes using nodeid parameter. Here each node holds the individual local field information. Whenever the data transmission is continued the node which stores the particular data started to transmit the data from source to destination[16]. The process is iterated until destination is reached.

Let n = number of nodes in the system

P_n = Probability of n nodes in the system

C = Number of services

μ= Load and store rate

λ= forward rate

$\mu_n = n\mu$ 1<n<c = C μ, n>C

$\lambda_n = \lambda$For all n>0, $= \left[\frac{n\mu}{c\mu}\right]$ where 1<n<c.

For a static model we need

$$P_n = \frac{\lambda_n}{(n\mu)[(n-1)\mu][(n-2)\mu]...(1\mu)} P_0 \qquad \text{for } 1<n<c$$

$$P_n = \frac{\lambda_n}{\left\|(C\mu)(C\mu)\ldots\ldots.(C\mu)\right\|(C\mu)\left[(c-1)(\mu)\left[(c-2)(\mu)\ldots\ldots(1\mu)\right]\right.} P_0$$

Applying the P_n for all valid nodes n with the function $\sum_{n=1}^{\varpi} P_n = 1$

$$P_n = \frac{1}{\left[\sum_n^{\varpi} = 1\frac{1}{n:}\left(\frac{\lambda}{\mu}\right)^n + 1\frac{1}{c:}\left(\frac{\lambda}{\mu}\right)^c\left(\frac{\mu c}{\mu c - \lambda}\right)\right]}$$

The above obtained result is valid if $(\mu_c)^{-1} < 1$.

4. Adaptive Point Framework

Adaptive point framework is developed to route the node movement and to validate the node at equal interval of the mobility. Adaptive point framework is fully utilized by the Semi cloud where the local information of the mobile node is guarded by the Adaptive point. In the experiment we generated the packet range from 20-500. The results has been denoted as here to obtain by running algorithms twenty times independently. The basic performance metrics are TTL, TTL_EXPIRATION, ROUTE_EXPIRATION, PATH_PREDICTION shown in Table 1 and Table 2 etc.

5. D²RCR Algorithm

At initial stage

$W_0(L,r) = \frac{V_r}{n}$;

$U_0(L,r) = 1$;

$H_0(r) = 0$;

In Route level

$U_0(L, r)$ ←Initial level traffic field s as L;

For each L←1~n

If ($U_{i=2}$ (L, r) ≤ $M_{j=2}$ (L, r))

Forward the request

Else

P= (load (*Ui=2 (L,r)* ≤) && store *(Mj=2 (L,r)))*

If(Adapt<p)

Drop the request

Else

Forward the request

Publish the local route informationU_0&U0 (L, r);

Subscribe the global traffic informationH0 (r);

Publish the global traffic and routeH_1 (r);

H_0 (r)= $H_0(r) = \sum_{L=1}^{n} T(L,r)$;

Q (L,r) =;

End.

6. Results

Table 1. Packet forwarding along with payload, TTLvalues and failure condition

Status	Source Address	Destination Address	TTL	Payload	Path Length	Failure Condition
1	4	3	19	Packet 0 from 4 to 3	2	OBSOLETE_ROUTE TTL_EXPIRATION
1	4	3	19	Packet 1 from 4 to 3	2	OBSOLETE_ROUTE
1	4	3	19	Packet 2 from 4 to 3	2	OBSOLETE_ROUTE
1	4	3	19	Packet 3 from 4 to 3	2	OBSOLETE_ROUTE
0	4	3	19	Packet 4 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	0	Packet 5 from 4 to 3	20	OBSOLETE_ROUTE
0	4	3	19	Packet 6 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 7 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 8 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 9 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	4	Packet 10 from 4 to 3	16	OBSOLETE_ROUTE
0	4	3	5	Packet 11 from 4 to 3	15	OBSOLETE_ROUTE
0	4	3	19	Packet 12 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	5	Packet 13 from 4 to 3	15	OBSOLETE_ROUTE
0	4	3	19	Packet 14 from 4 to 3	1	OBSOLETE_ROUTE TTL_EXPIRATION
0	4	3	0	Packet 15 from 4 to 3	20	OBSOLETE_ROUTE
0	4	3	19	Packet 16 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 17 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 18 from 4 to 3	1	OBSOLETE_ROUTE
0	4	3	19	Packet 19 from 4 to 3	16	OBSOLETE_ROUTE

Table 2. Various iterations

Iteration	Destination	8->2	8->6	8->0	8->4	7->4	9->1	9->5	2->8
1	8	1	1	1	1	1	1	1	1
2	8	1	1	1	1	1	1	1	1
3	8	1	1	1	1	1	1	1	1
4	8	1	1	1	1	1	1	1	32
5	8	1	1	1	1	1	1	1	243
6	8	1	1	1	1	1.330816	1	1	159.8158
7	8	1	1	1	1	1.330816	1	1	750.3427
8	8	1	1	1	1	1.330816	1	1	2440.608
9	8	1	1	1	1	1.330816	1	1	6333.866
10	8	1	1	1	1	2.191836	1	1	6333.866
11	8	1	1	1	1	1.294257	1	1	3740.084
12	8	1	1	1	1	1.294257	1.330816	1	3740.084
13	8	1	1	1	1	1.294257	1.330816	1	3740.084
14	8	1	1	1	1	1.294257	1.330816	1	3740.084
15	8	1	1	1	1	1.294257	1.330816	1	3740.084
16	8	1	1	1	1	1	1	1	2208.482

Table 3. Route path

Status	Source Address	Destination Address	TTL	Payload	Path Length	Failure Condition
0	2	8	19	Packet 0 from 2 to 8	1	Routing_Failure
1	2	8	14	Packet 1 from 2 to 8	7	
1	2	8	13	Packet 2 from 2 to 8	8	
1	2	8	19	Packet 3 from 2 to 8	2	
1	2	8	19	Packet 4 from 2 to 8	2	
1	2	8	3	Packet 5 from 2 to 8	18	
1	2	8	19	Packet 6 from 2 to 8	2	
1	2	8	19	Packet 7 from 2 to 8	2	
1	2	8	19	Packet 8 from 2 to 8	2	
1	2	8	11	Packet 9 from 2 to 8	10	
1	2	8	12	Packet 10 from 2 to 8	9	
1	2	8	3	Packet 11 from 2 to 8	18	
1	2	8	4	Packet 12 from 2 to 8	17	
0	2	8	0	Packet 13 from 2 to 8	20	
0	2	8	0	Packet 14 from 2 to 8	20	
0	2	8	0	Packet 15 from 2 to 8	20	TTL_EXPIRATION
1	2	8	12	Packet 16 from 2 to 8	9	TTL_EXPIRATION
0	2	8	0	Packet 17 from 2 to 8	20	TTL_EXPIRATION
1	2	8	18	Packet 18 from 2 to 8	3	

7. Conclusion

In this paper we presented store and forward mechanism, cloud based architecture for on body routing in HAN. Our conventional approach effectively utilizes the approach of mobility in the cloud environment. Our approach equally deals the mobile (HAN) nodes as cloud service node and end users of the cloudservices. We elaborate the content based on body routing service to address the basic routing problem at low range. Our run time demonstration shown in Table 3 outstrips the previous solution in terms of route reliability. The routing mechanism is practical and hence can be applied for general cloud systems.

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