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Multi Service Composition in Mobile Ad Hoc Networks

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Abstract— in MANETS as the nodes are not static and are not available all the times still the Composite service provision become a great challenge and its success rate is not satisfactory In mobile ad hoc networks, usually Composite service is achieved through the service composition . the main reason for the fall of the success rate of service composition is involving more number of nodes and the node's failure probability is proportional to the length of time the node exist in the networks. In this paper in order to improve the success rate of service composition we are suggesting several measures. First, we split the service requirement into several segments and cluster the nodes, so that the nodes' waiting time for service composition can be reduced. Second, we propose a new node model of "one node contains multiple services" in mobile ad hoc networks. Using this type of nodes model, the number of nodes required for service composition can be reduced. These means can increase the success rate of service composition.

Key words: **Composite service ,** service composition; mobile ad hoc networks; cluster; requirement splitting

1. INTRODUCTION

A service-oriented mobile ad hoc network (MANET) is populated with service providers (SPs) and service requesters (SRs). A realization of service-oriented MANETs is a peer-to-peer service system with SPs providing web services and SRs requesting services, each requiring dynamic service composition and binding [26]. Unlike a traditional web service system in which nodes are connected to the Internet, nodes in service-oriented MANETs are mobile and an SR will need to request services from available SPs it encounters and with which it interacts dynamically. It is particularly suitable to military MANET applications where nodes are mobile with multi-hop communication.

In this paper, we are concerned with increasing the success rate of service composition .

For example in a battle field nodes are moving form a mobile ad hoc network. A node needs a requirement of service composition including 10 services *s*0, *s*1, *s*2, ... *s*9 , which exist in the other nodes of the network .

Assuming that the services are executing in sequence .after successful execution of seven services nodes offering services *s8 and*, *s9 are* get off the network. subway, and the nodes which provide the services *s*8 and *s*9 leave the network. If the substitutes of services *s*8 and *s*9 cannot be found in the network, the service composition may fail. hence we are suggesting node model of "one node contains multiple services" in mobile ad hoc networks. Using this type of nodes model, the number of nodes required for service composition can be reduced. These means can increase the success rate of service composition.

2. RELATED WORK

Centralized execution: [3] presents a task graph based framework for application composition in MANETs for the purpose of minimizing average path length of task graph. [4] adopts a broker to handle the execution of composed request. The broker relieves the pressure for centralized architecture, which is capable of executing on any node. Such centralized execution pattern increases the length of *EP* significantly, since the intermediate results should be exchanged via the control node.

Decentralized execution: A service composition based on a fuzzy system is proposed in [5] to select the path for service execution in MANETs. During execution, request source selects the service provider with the highest path potential value, which is provided by service discovery and service advertising. [6] presents a service composition and recovery framework in order to achieve minimum service disruptions in MANETs. It selects the service *EP* satisfied the QoS requirement. [7] presents a composition scheme called as SeSCo. The selection of path is limited within the service zone and operated dynamically. But it is a part probing in service zone and it is high cost for zone building**.**

Behavior Evolution Service Composition

In this method, taking full use of the experiences (expressed by rules) acquired from previous service composition process, every flow node tries to select a certain number of services from its neighbor services which it can be composed with in a probabilistic approach.

Here *behavior* means the selection of services which a flow node can be composed with; *evolution* means that the selection process can be increasingly efficient with the accumulation of experiences. This method consists of two mechanisms: *Rule Acquirement* and *Rule Utilization*.

Rule Acquirement: in this phase We can express experiences by the form of rules. For a flow node, we generate rules according to the flow like this: the precondition of rule is the output pattern of a flow node which is reachable from

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current flow node, the postcondition of rule is the service(s) to be composed with:

St: IF *O* THEN *{St*+1_*IDt*+1_*}*

It means that service *St* is composed with *{St*+1_*IDt*+1_*}* to obtain the output pattern *O* according to current flow.

Rule Utilization: In this phase a node sends the service request packet to certain number of selected neighbors instead. To determine

which neighbors to be selected, the mobile node broadcasts a *service query* packet

first. The packet contains {*tid, idk, St_IDt,Ot}*, which indicates the service in *idk* to continue task. When a mobile node *idk*+1 receives a service query packet, it processes the request as following:

1. *idk*+1 checks the services it possesses to find a service *St*+1 which can be composed with *St*. If there does not exist one, discard the service query packet.
2. Otherwise, if *St* and *St*+1 can be composed, but the pair *{tid, St*+1*(IDt*+1 *)}* already exists in *idk*+1's list of *(taskid, serviced)* pairs, discard the service query packet.
3. Otherwise, return a *service acknowledge* packet to *idk*. The packet contains *(idk*+1, *St*+1*(IDt*+1*,Ot*+1, *Ct*+1*)M)* where *M* indicated whether *idk* and *idk*+1 can be completely composed or not.

Service composition Architecture:

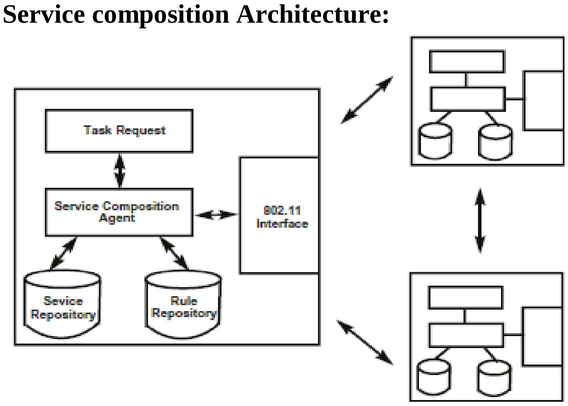

Fig 1: Service composition Architecture:

Service Repository: The service repository module describes the basic information (input pattern, output pattern and function) of services a node has and

the relationship between services..

Rule Repository: The rule repository module stores the rules accumulated in the process of service composition. These rules can be used to direct the future service composition process. Taking advantage of this feature, if we already have the knowledge of an existing service composition flow, we can express the flow by the form of rules with high confidence, and deposit these rules in the nodes which have corresponding services. It will also be useful to collect and analysis the rules accumulated in several nodes. A rule has high confidence means the services in the rule are composed frequently. We can select the rules with high confidence, combine these services in rules that can be composed into a new

service composition flow, and treat this flow as a new service because the services in the flow are used together frequently

But this approach involves more service query and acknowledgement packets transformation among the nodes of network which needs more time than the time taken for actual information transformation. This causes the fall in the success rate of the service composition.

3. PROPOSED WORK: in previous techniques we done service composition by taking only one service from each node, but due to the dynamic nature of the manets nodes went off frequently. Hence more number of nodes involvement in service composition leads to high failure rate of the service composition.

So in our proposed work we are suggesting a new model which we involves a node in several services composition.

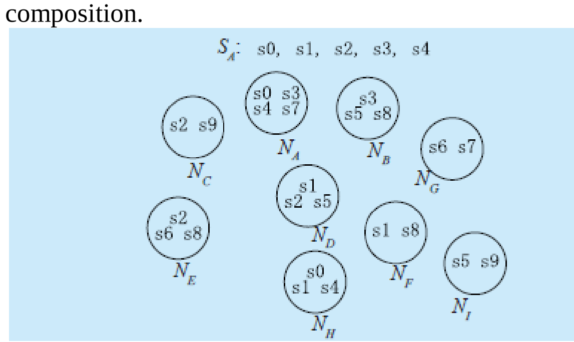

Fig 2: a node contain several services.

For example here we need two services S_A and S_B. To be composed with s0,s1,s2, s3 and s2, s3, s7 respectively. For this requirement we need seven nodes involvement but using our model as shown in fig 2 we can compose SA and SB with four nodes only.

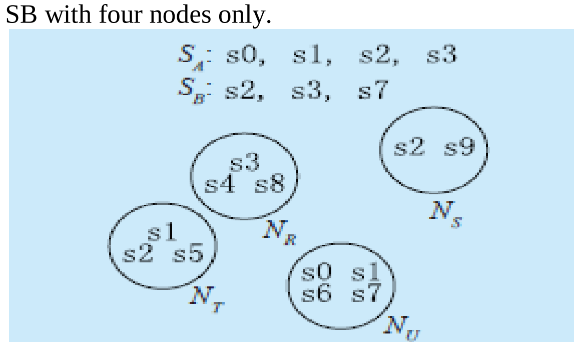

Fig. 3 Two composite services: S_A, S_B and four nodes N_R,N_S,N_T,N_U

3.1 The Process of service composition

When a requirement of service composition is proposed, it will experience the process of requirement splitting, nodes grouping and nodes clustering, etc. The process is depicted in Figure 4.

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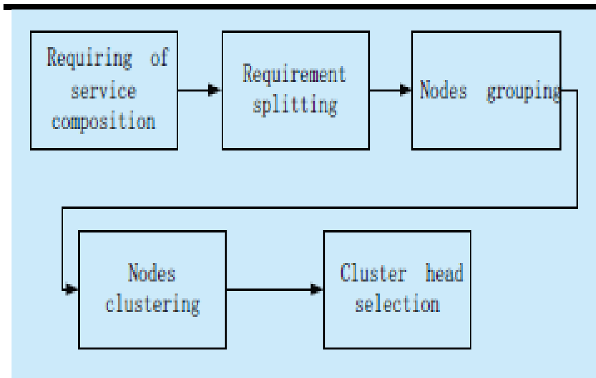

Fig. 4 process of service composition

3.2 Requirement splitting

After a necessity is proposed, the long prerequisite can be separated into various service segments as per the reasoning of a few services that can be executed in parallel. Each portion contains a few services. Nodes giving these services constitute a node gathering, so every service in a segment is contained in a gathering. Since there are a few services which can be executed simultaneously in the necessity, the prerequisite has a few part techniques.

We expect that to finish an errand requires m services s0, s1, ..., sm−1, and the serial quantities of the services are persistent. In other words, the prerequisite of service organization S contains s0, s1, ..., sm−1, i.e., S is:

S={s0, s1, s2, ..., sn, [sn+1], sn+2, ...,

sl, [sl+1], sl+2,..., sm−1}

In Figure 5, S is partitioned into K sections,

what's more, the primary section comprises of s0, s1, ..., sn. In like manner, in the systems, the beginning node containing the beginning service s0 communicates its area in the systems initially. This node searches for the node containing the successor benefit s1 as per the broadness first system, and the node containing the service s1 searches for the successor benefit s2, etcetera. The successor services number must be consecutively ceaseless.

In the event that every one of the services contained in a section can be found in the systems, the nodes giving these services constitute a node gathering. The nodes containing services s0 to sn make a gathering. In the event that n<m−1, the node in this gathering which contains the last service sn advises the node which contains benefit sn+1. Service sn+1 will be the following beginning service in the second fragment of the composite service. The second beginning node containing the service sn+1 will search for successor benefit sn+2. Expecting the maximum numbered benefit in the second portion is su, if u<m−1, the nodes rehash the above strides, until they have discovered the last service sm-1 in the systems.

Also, services from sn+1 to su have a place with the second section, and nodes containing these services constitute the second node gathering.

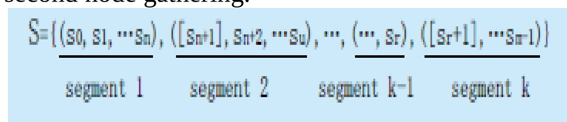

Fig. 5 Requirement splitting

Algorithm: Requirement splitting and node grouping for service composition
//*k*: the number of node group
//*Tk*: the set of nodes which contains services
set Tk = NULL k = 0
for (i=1; i<=m-1; i++)
{
if service *si* is not the starting service of a segment
{
To seek service *si* in *Tk*
if *si* is in *Tk*
continue
else
{
Seek in the networks
Add the node containing *si* to
}
}
else
{
k + + //staring a new node group
Add the node containing service to *Tk*
continue
}
}

3.5 The algorithm to select the cluster members from the group

Continuously numbered n services s1, s2, ..., snv shape a fragment of a composite service S. Let S1 {s1, s2, ..., sn}, S={S1, S2, ..., SW}. These n services s1, s2, ..., sn are contained in L nodes N1, N2, ..., NL. L is not really equivalent to n.

Nodes N1, N2, ..., NL constitute a gathering C1 . Let T1 {N1, N2, ..., NL}. In C1, there might be a few nodes giving a similar service.

For instance, as appeared in Figure 6, the nodes NC, ND, NF can all give the service s3. Our goal is to discover the ideal nodes and select these nodes to constitute a group.

The calculation to choose fitting nodes in a gathering to constitute a group is depicted as takes after:

https://dx.doi.org/10.22161/ijaers/nctet.2017.30 ISSN: 2349-6495(P) | 2456-1908(O)

(1) Let R1=S1. Here S1 is the arrangement of the services contained in an service section. We can recognize the correspondence connection amongst nodes and services by two Tables. Drilling down the comparing relationship from services to nodes, we can see which nodes can give the service. Furthermore, drilling down the comparing relationship from nodes to services, we can see which services are given by a node.

(2) For a few services, in the event that they are given just by one node, this node is chosen as a bunch part. Erase these services from R1.

(3) If the node in (2) additionally contains different service(s) which have a place with R1, at that point the service(s) must be given by this node. Erase the service(s) from R1.

(4) If R1 ≠ Ø. Do (5) and (6)

(5) According to the request of the service number, we can choose a suitable node which gives the service. From the Tables recorded in (1), we can see that if the node contains the biggest measure of services which have a place with R1, at that point the

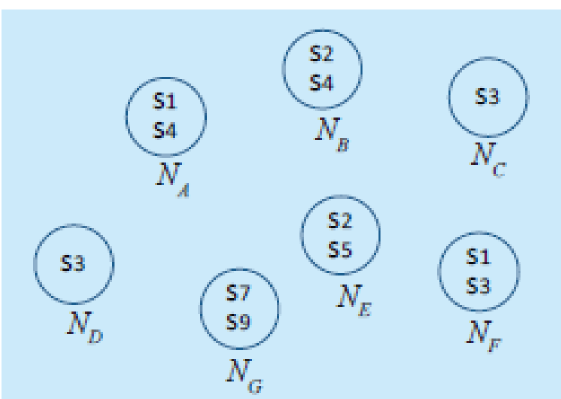

Fig: 6 an example

node is chosen as the bunch part. Erase these services frame R1.
(6) If a few nodes have a similar measure of helpful services, we select the node as the bunch part as per their F esteem (calculation 3, area 3.6). Rehash the above strides (5) and (6). Erase these services from R1.
(7) If R1 = Ø, the operation is finished. Taking Figure 9 for instance, we clarify the way toward choosing the nodes as the bunch individuals as per the above calculation. We accept S1 {s1, s2, s3, s4, s5}.

Step (1) R1 S1, at that point R1 {s1, s2, s3, s4, s5}. We drill down the connection between the nodes and the services in the Table I and Table II.
From Table I, we can see which nodes can give the service. Table II signifies which services are given by a node.

Step (2) Because the service s5 is given just by the node NE, at that point the node NE is chosen as a group part. We erase S5 from R1, and now R1 {s1, s2, s3, s4}.

Step (3) Node NE additionally contains benefit s2, s2∈R1. At that point the service s2 which S1 required is given by node NE. We erase s2 from R1, and now R1 {s1, s3, s4}.

Step (4) R1 ≠ Ø. We examine the node in Table I and Table II. The service s1 is given by the node NA and . The node NA contains s4, and s4∈R1. The node NF contains s3, and s3∈R1. At that point the node NA and NF can both be chosen as the individual from the bunch.

3.6). **Table I** *The services and the nodes which provide the services*

*s*1 : *NA*, *NF*
*s*2 : *NB*, *NE*
*s*3 : *NC*, *ND*, *NF*
*s*4 : *NA*, *NB*
*s*5 : *NE*
*s*7 : *NG*
*s*9 : *NG*

Table II *The nodes and the services which a node can provide*

NA : *s*1, *s*4
NB : *s*2, *s*4
NC : *s*3
ND : *s*3
NE : *s*2, *s*5
NF : *s*1, *s*3
NG : *s*7, *s*9

Step (5) In the step (4), if NA is selectedas the cluster member, then R1={s3}. Now, we can select the node NC or ND as the cluster member because both of them can provide s3, then R1 = Ø. The operation of selecting the nodes as the members of the cluster is over.
The sequence for selecting the node to the cluster is NE→NA→NC(or ND).
The composition sequence of the service S 1 i s
NA(s 1) →NE(s 2) →NC(o r ND)
(s3)→NA(s4)→NE(s5).
Step (6) In the step (4), if we select the NF as the cluster member, then R1={s4}. Now, we can select the node NA or NB as the cluster member because both of them can provide s4, then R1 = Ø.
The operation of selecting the nodes as the member of the cluster is over.
The sequence for adding the node to the cluster is NE→NF→NA(or NB).
The composition sequence of the service
S1 is NF(s1)→NE(s2)→NF(s3)→NA(or NB)
(s4)→NE(s5).

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4. CONCLUSION

This paper shows a novel model in which a node contributes multiple services for service composition . so that we could able to reduce number of nodes involved in a service composition, consequently we reduced failure rate of composite service. We propose a requirement splitting and node clustering methods for composite service.

5. REFERENCES

[1] WU Xiaokun*, TIAN Yue, WU Jiyan, CHENG Bo, CHEN Junliang "A Composite Service Provision Method Based on Novel Node Model in Mobile Ad Hoc Networks"

[2] Qing Zhang1, Huiqiong Chen2, Yijun Yu3, Zhipeng Xie1, and Baile Shi1" Dynamically Self-Organized Service Composition in Wireless Ad Hoc Networks"

[3] W. Ke, P. Basu, and T.D.C. Little, "A Task Graph Based Application Framework for Mobile Ad Hoc Networks", in Proceeding of IEEE Internal Conference on Communication, NY, April-May 2002. vol.5, pp.3279-3283.

[3]D. Chakraborty, A. Joshi, Y. Yesha, and T. Finin, "Service Composition for Mobile Environment", Journal on Mobile Networking and Applications, Special issue on Mobile Services. August 2005, vol.10, no.4, pp.435-451.

[4]G. Prochart, R. Weiss, R. Schmid and G. Kaefer, "Fuzzybased Support for Service Composition in Mobile Ad Hoc Networks", in Proceeding of IEEE International Conference on Pervasive Services, 2007, pp.379-384.

[5]S. Jiang, Y. Xue and D. C. Schmidt, "Minimum Disruption Service Composition and Recovery over Mobile Ad Hoc Networks", in Proceeding of the Annual International Conference on Mobile and Ubiquitous Systems: Networking & Services, 2007, pp.1-8.

[6]S. Kalasapur, M. Kumar and S. Shirazi, "Seamless Service Composition (SeSCo) in Pervasive Environments", in Proceedings of ACM international workshop on Multimedia service composition, 11.Nov, 2005. pp.11-20.

[7]N. Sadagopan, F. Bai, B. Krishnamachari, and A. Helmy, "PATHS: Analysis of Path Duration Statistics and Their Impact on Reactive MANET Route Protocol", In Proceeding of The ACM International Symposium on Mobile Ad Hoc Networking and Computing, June, 2003. pp.245-256.

[8] KUN YANG, ALEX GALIS, HSIAO-HWA CHEN. QoS-Aware Service Selection Algorithms for PervasiveService Composition in Mobile Wireless Environments[J], Mobile Networks Appl, 2010, 15: 488-501

[9] I. PAPAPANAGIOTOU, D. TOUMPAKARIS, J. LEE, et al. A Survey on Next Generation Mobile Wi-MAX Networks: Objectives, Features and Technical Challenges[J], IEEE Commun. Surveys Tuts, 2009, 11(4): 3-18.

[10] KUN ZHU, DUSIT NIYATO. Dynamic Service Selection and Bandwidth Allocation in IEEE 802.16m Mobile Relay Networks[J], IEEE Journal on Selected Areas in Communications, 2012, 30(9): 1798-1805.

[11] U. MOHAN, K. C. ALMEROTH, et al. Scalable Service Discovery in Mobile Ad Hoc Networks[J], Networksing, 2004: 137–149.

[12] D. NIYATO AND E. HOSSAIN. Dynamics of networks selection in heterogeneous wireless networks: An evolutionary game approach [J] IEEE Transactions on Vehicular Technology, vol. 58, no. 4, pp. 2008-2017, May 2009.

[13] WU Xiaokun*, TIAN Yue, WU Jiyan, CHENG Bo, CHEN Junliang A Composite Service Provision Method Based on Novel Node Model in Mobile Ad Hoc Networks: State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications, Beijing, 100876, P. R. China