LD Algorithm in Multimedia Transmission

Shu Li
Hunan City University, Yiyang, 413000, China

Abstract: Aiming at the problems in service oriented real-time multimedia transmission, such as a long delay, frequent jitter and low reliability, this paper proposes LD/R Path algorithm LD/R Path estimates the dynamic data volume on service nodes and links through reasonable data volume approximation. And the data splitting technique is imported to convert the node delay into the edge delay. In the mean time, the reliability of nodes is considered so that the multimedia delivery problem is transformed into a conventional shortest path problem. The experimental simulation results show that the algorithm is a kind of high efficient and reliable algorithm spending smaller complexity achieving good path selection performance.

Keywords: Multimedia; Approximation of the Amount of data; Node; Price Label

1. Introduction

In the service-oriented real-time multimedia transmission system, the service requests having the same functional requirements is often able to complete by a variety of service composition ways[1-3]. At running time, each service component can choose different service counterparts to achieve. In real-time multimedia system, the users are very sensitive to time delay so the user cannot accept long delay and frequent jitter of multimedia information. In addition, service users can't control service because services are also affected by equipment, environment and other factors in the pervasive environment[4-5]. The services have great differences between individuals and the reliability of the individual services will eventually determine the expected performance of composite services. Therefore, it is a challenging problem about how to choose a series of appropriate service copies to constitute high credible service path with the low latency in pervasive environment.

Zeng and the others think the service copies should be ch. This paper mainly makes development and innovation from the following aspects.

(1) Aiming at the problems in service oriented real-time multimedia transmission, such as a long delay, frequent jitter and low reliability, this paper proposes LD-RPath algorithm LD/RPath estimates the dynamic data volume on service nodes and links through reasonable data volume approximation. And the data splitting technique is imported to convert the node delay into the edge delay. In the mean time, the reliability of nodes is considered as a coefficient of delay, so that the multimedia delivery problem is transformed into a conventional shortest path problem. The advantages of this algorithm are as follows. 1) The reliability is integrated into the edge weights reasonably, which guarantee the reliability in the choice of the shortest path. 2) The reasonable approximate of data reduces the problem's complexity. 3) Node split integrates node weights into edge weights.

(2) In order to further validate the correctness and validity of LD-R Path algorithm, the simulation experiment is made to compare the algorithm proposed in this paper, the Random algorithm and the optimal algorithm. In 50 groups of experiments, there are 42 times that the results of LD/R Path algorithm are better than those of the Random algorithm and 9 times that the results of LD/R Path algorithm are better than those of the Optimal algorithm. When the network size is 30, there are 94 times that LD/R Path algorithm creates the path delay, which is smaller than the Random algorithm. When the network size reaches to 1600, the times that the path delay created by LD/R Path algorithm is smaller than Random algorithm reduce to 82 times that. The experimental simulation results show that the algorithm is a kind of high efficient and reliable algorithm spending smaller complexity achieving good path selection performance while imposing low overhead to the system.

2. LD/R Path Algorithm

2.1. The price label

Service chart after the above 3 steps after the conversion, each side is marked time delay cost now. If a boundary is an internal edge, then it is the price of the following form.

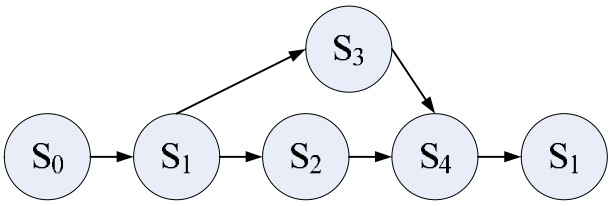
$$\frac{1}{e_i}.m.o_i \quad (1)$$

Among them, e_i and o_j are reliability and unit processing time of the internal edges represent service replica node, MI is the approximate amount of data; otherwise, this edge is the price of the following form:

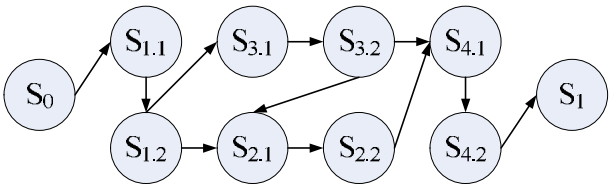
$$\frac{m_i}{b_j} \quad (2)$$

Among them, b_j is the service bandwidth, m_i is the service on the edge of the approximate amount of data transmission.

Figure 1 shows a simple conversion example. Figure 1(a) is a service graph, assume that the only 1 copies of each service (similar to handle multiple copies), node splitting, converted to figure 1 (b). s_0 and s_t shown is the node of source data and the destination node.



(a) Aservice graph



(b) Transformed service graph

Figure 1. Shows a simple conversion example

Considering the amount of data approximation and reliability conversion, assuming the initial data in the s_0 for the amount of M, then figure 1 (b) between $s_{1,1}$ and $s_{1,2}$ in the inner side of the price for $\frac{1}{e_1} m.r_0.o_1$, said the reliability of node s_1 data processing delay is multiplied by s_1; $s_{3,2}$ and $s_{2,1}$. Edge costs

$$\frac{m.r_0.r_1.r_3}{T_{3,2}} \quad (3)$$

Composed of transmission delay on the link between $s_{2,2}$ and $s_{4,1}$; on the side of price is as follows.

$$\frac{m.r_0.r_1.r_2 + m.r_1.r_0.r_2.r_3}{2T_{2,2-3,1}} \quad (4)$$

Because of this edge on the amount of data has two possible values (one is from s_0 through s_1 and s_3 transfer to s_2, two to s_2 from $s\,s_0$ by s_1 transmission), the cost of data approximation; $s_{4,1}$ and $s_{4,2}$ between the inner side of the price.

$$\frac{1}{e_4}.\frac{m.r_0.r_1.r_3 + \frac{m.r_0.r_1.r_2 + m.r_1.r_0.r_2.r_3}{2}}{2}.o_3 \quad (5)$$

The internal side represents the service node has two precursor node, but also one of the precursor node still has two precursor node. So, in two the amount of data approximation.

2.2. Time complexity

After the cost of labeling on service chart, you can use the shortest path algorithm to solve the problem. For the shortest path, node sequence we will produce a reduction to convert before service graph, paths can be obtained from LD/R Path. We'll let N_n and N_e respectively to represent a number of the number of nodes and edges the original service in the graph. The approximate second algorithms in data quantity, because each node at most connected with the N_n nodes, so the process of traversal of all edge up N_n times, the complexity of this part is $O(N_n N_e)$; in the third part the same each node is visited once, at the same time to find the all of its possible precursor node, this part of the complexity is $O(N_n N_e)$. The process of node splitting and data approximation are very similar, need to deal with each node, and then determine the precursor node and successor node need access to the N_e side, because of the complexity, this part of the $O(N_n N_e)$. In the reliability of conversion, since only Nn internal boundary, so the complexity is $O(N_n)$. The cost of annotation to deal with each edge, complexity is $O(N_e)$. The shortest path algorithm, we use the Dijkstra algorithm, its complexity is $O(N^2)$, wherein, n represents the number the vertices in the graph. According to the node the division process with n **p** $2N_n$, at the same time, according to the rules of the complete graph $N_e \le N_n^2$ of LD/R Path algorithm, so the total time complexity.

$$O(N_n N_e + N_n N_e + N_n + N_e + n^2) = O(N_n^3) \quad (6)$$

3. Experiment and Simulation

In addition, it is also compared the LD/R Path and Random algorithm in the node size selection effect of 30, 60100400900 and 1606 time (there is no comparison of Optimal algorithm, Optimal algorithm cannot because nodes in large scale to ensure real-time). In each node size, we run 100 experiments, each experiment consisted of 1 LD/R Path algorithm and 20 times of Random algorithm, Random algorithm results from Random-Best, the results as shown in Figure 2.

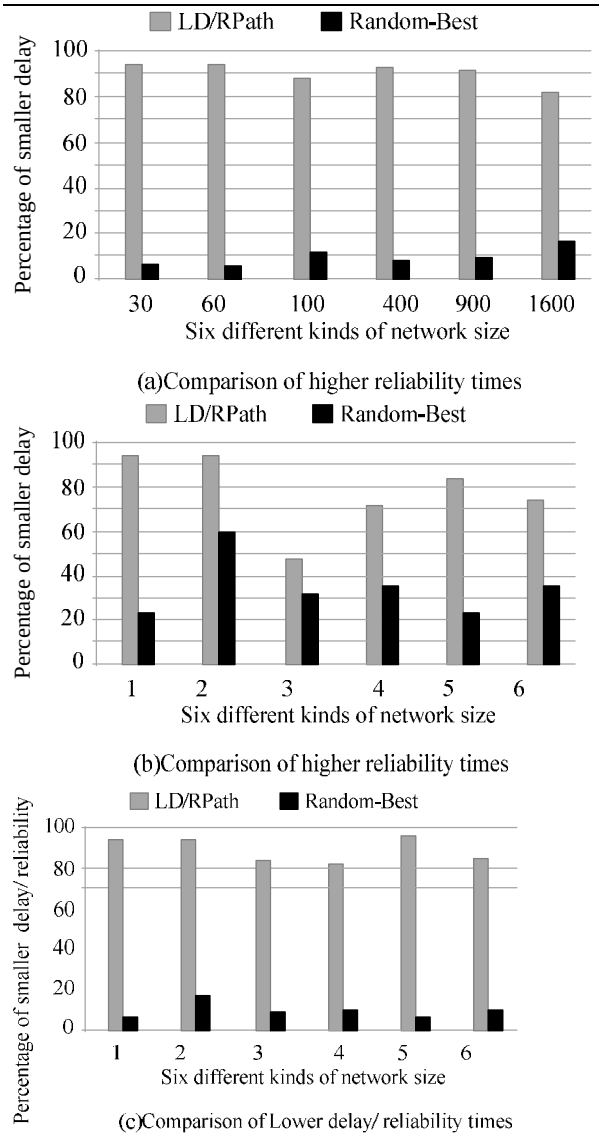


Figure 2. The LD/R Path algorithm and Random-Best algorithm in different network scale path selection effect comparison

Figure 2 (a) expression in 6 different kinds of service network scale, 100 groups of experiments LD/R Path algorithm the number of generated path delay is smaller compared with the Random algorithm. We see, in the 6 case, the path delay were produced by LD/R path algorithm 90 times, smaller than the Random-Best algorithm. We also observed to, as the network size increases, the performance of LD/R Path algorithm is slightly decreased, the size of the network for the 30 time, delay path LD/R Path algorithm produces is 94, smaller than the Random-Best algorithm; when the network size of 1600, times delay than Random-Best algorithm LD/R Path algorithm produces small drops to 82 times Fig. 2 (b) and 2 (c) respectively are compared both reliability and delay / reliable than. And Figure 2 (a) of the similar situation, we see the selection effect of LD/R Path algorithm is much better than Random algorithm.

4. Conclusion

Aiming at the problems in service oriented real-time multimedia transmission, such as a long delay, frequent jitter and low reliability, this paper proposes LD/R Path algorithm LD/R Path estimates the dynamic data volume on service nodes and links through reasonable data volume approximation. And the data splitting technique is imported to convert the node delay into the edge delay.

References

[1] Tavallaee,M. and Cybernetics, 2010, Toward credible evaluation of anomaly-based intrusion-detection methods, Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on,pp516-524

[2] Al-karaki J.N., and Kamal A.E.,"Routing techniques in wireless sensor networks: a survey", IEEE Wireless Communication, vol.11, pp. 6–28, November, 2004.

[3] Liangduan Zhao, Zhiyong Yuan, Xiangyun Liao, Weixin Si, Jianhui Zhao.3D Tracking and Positioning of Surgical Instruments in Virtual Surgery Simulation. Journal of Multimedia, Vol. 6, No. 6 (2011), 502-509

[4] C. Bfhm, S. Berchtold, D.A. Keim, "Searching in High-Dimensional Spaces: Index Structures for Improving the Performance of Multimedia Databases", ACM Compute, 33(3), pp. 322-373, 2007

[5] Paxson, V., Sommer, R., Weaver, N., 2008. An architecture for exploiting multi-core processors to parallelize network intrusion prevention. In: Sarnoff Symposium, 2007 IEEE. IEEE, pp. 1–7.