Advance Journal of Food Science and Technology 11(7): 529-533, 2016
DOI:10.19026/ajfst.11.2675
ISSN: 2042-4868; e-ISSN: 2042-4876

Submitted: July 29, 2015 Accepted: August 20, 2015 Published: July 05, 2016

Research Article

Multimedia Transmission in Food Network System Based on LD/R Path Algorithm

[1]Chai Xuguang, [2]Huo Lina and [2]Li Wei
[1]Xingtai Polytechnic College,
[2]Xingtai University, Hebei Province, China

Abstract: The characteristic of multi-media Transmission in food network system is analyzed and the technology requirements are studied. Parameters of performance are put forward to scaling QoS. The influencing factors are analyzed and solving methods are proposed. This study 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 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: Food network system, multi-media, reliable algorithm, transmission

INTRODUCTION

Based on real-time multimedia Transmission in food network system, this study inspects the service path's selection criteria of reliable multimedia Transmission in food network system from the two angles. The first is the real time. The users want to get the real-time data, but if there is a lot of data Transmission in food network system delay, it won't be reliable to the users. The second is reliability. Due to the dynamic and heterogeneous of environment, each service copy may have errors and if the service paths chosen by system go wrong, the system has to choose a service path again to complete the service request, which can increase system loading. Besides, for the users, path switching also increases time delay further, so the service provided by the system is no longer reliable. It is the aim of this study that when the service requests are given, the appropriate service copies are selected to build multimedia Transmission in food network system path with low latency and high reliability.

This study mainly makes development and innovation from the following aspects:

- Aiming at the problems in service oriented real-time multimedia Transmission in food network system, such as a long delay, frequent jitter and low reliability, this study 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 (Berangi *et al*., 2011). 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:
    - o The reliability is integrated into the edge weights reasonably, which guarantee the reliability in the choice of the shortest path
    - o The reasonable approximate of data reduces the problem's complexity
    - o Node split integrates node weights into edge weights.
- In order to further validate the correctness and validity of LD-RPath algorithm, the simulation experiment is made to compare the algorithm proposed in this study, the Random algorithm and the optimal algorithm. In 50 groups of experiments, there are 42 times that the results of LD/RPath algorithm are better than those of the Random algorithm and 9 times that the results of LD/RPath algorithm are better than those of the Optimal algorithm. When the network size is 30, there are 94 times that LD/RPath 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/RPath algorithm

Corresponding Author: Chai Xuguang, Xingtai Polytechnic College, Hebei Province, China

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.

MATERIALS AND METHODS

Multimedia transmission in food network system model:

Define the parameters: In a pervasive multimedia Transmission in food network system environment, the multimedia service nodes and the parameters of the network link directly affect the routing effect of algorithm. This section mainly shows that the parameters of the model and defines the problems.

Combined with the research question, the definitions of related parameters are given: bandwidth, unit processing time, IORatio and reliability. For the sake of simplicity, the difference between Transmission in food network system and spread is ignored. In the below description, the Transmission in food network system is used to represent the process that the data transmits from a node and it is accepted by the next node.

Bandwidth: Bandwidth refers to the current links' Transmission in food network system capacity the link between the two service nodes in multimedia Transmission in food network system environment, which is shown by B. Unit processing time: the unit processing time refers to the time which is taken to process unit data in a certain service node, which is shown by O according to the characteristics of the multimedia information. Multimedia system is data intensive application and the size of the amount of data has a great influence on processing time. In addition, due to the heterogeneity of service node, there are great differences among different service node's computing capacity (Kloeck *et al*., 2005). Therefore, the time which is taken to process unit data is used to measure the node's processing capacity.

IORatio: The IORatio is defined as the ratios of unprocessed data and processed data after a certain service processing, which is shown by r. It is also closely related to the characteristics of multimedia system. The services with different functions tend to have different effects on the amount of data. For example, the embedment of subtitles could hardly affect the quantity of the data, but the media data compression tends to make the amount of data become smaller. In general, the IORatio of services with different functions is different, but the IORatio of different copies of the same service is the same.

Reliability: The reliability expresses the degree of the reliability when a service processes nodes, which is shown by e according to historical data (Kchiche *et al*., 2008). This study uses the definition in literature that inspects K times system's calls for a certain service node in the past period of time and if the number of successful calls is C, e will be equal with C/k. Because the reliability is product parameter, the reliability of a service path refers to the product of all service nodes in this path (it is believed that all the links are reliable).

Delay: The delay includes transmission in food network system delay and data processing delay, which is represented by d. Because the delay is cumulative parameters, a service path delay refers to the sum of all nodes' processing delay and links' Transmission in food network system delay in this service path.

FUNCTIONAL IMAGE AND SERVICE IMAGE

Because for the same type of user's service, generally speaking, there are a variety of functions service combination can meet the demand. Therefore, the FG is used to represent the system the combination of all the possible functions of the service relationship. There are five basic assumptions system multimedia processing services, as shown in Fig. 1, then set off from f_0 to f_4 there are four possible ways of service combination, respectively ($f_0 f_1 f_4$, $f_0 f_1 f_3 f_4$, , $f_0 f_1 f_2 f_4$, $f_0 f_1 f_2 f_3 f_4$).

Function diagram describes the system function abstraction. Further more, each service has a plurality of service we consider all copies, copies of each service in the function diagram is extended form as shown in Fig. 2 service graph (service graph, referred to as SG). Service description is the dependence between the copies of all services, contains all the information of the system. In Fig. 2, assume that the service f_0 has 1 copy,

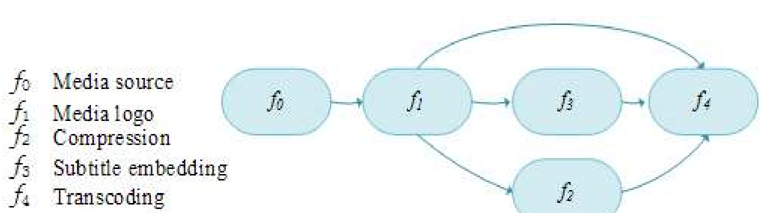


Fig. 1: Domain

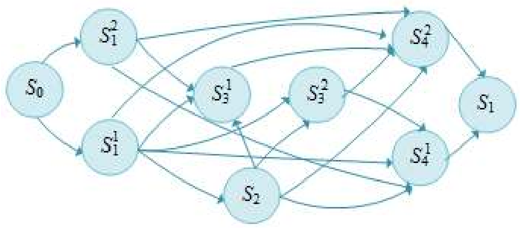


Fig. 2: Service area

2 copies of f_1, f_2 has 1 copy, 2 copies of f_3, f_4 has 2 copies and add a St as the final transfer of multimedia data the destination node to arrive. As we can see, $f_4\, f_0\, f_1\, f_2$ corresponds to a path in FG, if you choose as a service instance of f_1, as a service instance of f_4, then in SG service path specific. At the same time definition, if there exists a directed edge from the $SOs_4^2, s_1^2 s2 s_4^2$, then s_j is called the precursor node s_j, s_j for subsequent s_i.

Problem definition: Each service replica can be expressed as a four element (f, r, o, e), in turn, said compression type service to the service rate, copy unit processing time and reliability. For example, $s^2{}_1$ is expressed as (f_1, r_1, $o_{1,2}$, $e_{1,2}$). The goal of the system is in the choice of a time delay from s_0 to s_t in all paths as small as possible and the reliability is as large as possible path. In only considering the delay, due to changes in the amount of data, which is equivalent to a multi constrained path (multi-constrained path, referred to as MCP) problem. Wang proved that this problem is NP-complete problem. Exponential time complexity algorithm because the time-consuming, not applicable in real-time systems. Therefore, the lower time complexity and better algorithm are needed.

A service path delay ς_p is the sum of Transmission in food network system delay and data on the link processing delay at a node. It is assumed that m is the original amount of data, so m$w.p_0$ represents the processing delay of data in SO:

$$\varsigma_p = w.p_0 + \sum_{link_{i,j} \in p} \left(\frac{u_i.t_j}{h_{i,j}} + u_i.t_j.p_j \right) \tag{1}$$

In this format, $u_i.t_j$ represents the amount of data transferred to a certain service copy s_i:

$$\left(\frac{u_i.t_j}{h_{i,j}} + u_i.t_j.p_j \right)$$

Represents the sum of Transmission in food network system delay in a $link_{i,j}$ and the processing delay in s_j. The reliability t_j of a service path is the product of all service copies' reliability in this service path:

$$t_j = \prod_{s_i \in t^{r_i}} \tag{2}$$

The target is to make ξ_p smaller and t_j bigger. Optimization of the two targets is more complex, so it is proposed that the optimization objectives "ratio of delay and reliability" $\left(\frac{Delay}{\text{Re}liability}, DIR \right)$ is taken as the goal of optimization:

$$\left(DIR \right)_p = \frac{\xi_p}{t_j} \tag{3}$$

The problem is defined as follows: In a given service graph SG (V, E) conditions, how to choose a path from S0 to St Service and make the D/R as large as possible. It will be expressed in the following content in detail that an approximate algorithm is proposed based on this definition, which is called as LD/RPath algorithm (lowest delay/reliability path), to solving the problem in polynomial time.

RESULTS AND DISCUSSION

LD/RPATH algorithm: LD/RPath algorithm is an approximation algorithm whose idea is to transform the original problem into a conventional shortest path problem through a series of approximate conversion and then use classical the shortest path algorithm (such as Dijistra algorithm) to solve. The LD/RPath algorithm can in polynomial time complexity yields better results, since the original problem is NP- complete problem, it is not guaranteed to get the optimal results, but the experimental results show that, the algorithm obtains results close to the optimal solution. Next, from beginning of the amount of data approximation, design step by step LD/RPath algorithm's designed idea is introduced step by step.

The amount of data approximation: Some multimedia services will change the amount of data, so before the path was not determined, we cannot know a service node or link on the actual amount of data Transmission in food network system (Mirza and Anjum, 2012). A S0 data is m, so before the path is not determined, processing data may be from s_0 and $s_1^1(or\, s_1^2)$ Transmission in food network system reaches, there may be from s_0 $s_1^1(or\, s_1^2)$ reach and s_2 Transmission in food network system. Therefore, the data may be $m{\cdot}r_0{\cdot}r_1$. This uncertainty makes the problem become more complex, so it is needed to approximate amount of data processing.

As the algorithm shown in algorithm 1 data approximation, the main idea is that, for a service replica node s_i, assuming the L precursor node in the service map and then we considered the amount of data received by the s_i data volume is equal to the all L precursor node output of the arithmetic average. Note that these precursor nodes associated with the amount of data is similar, so this is a recursive process.

Algorithm 1: Approximation algorithm for data:

a) $Initialization: index[i] \leftarrow 0$ {Initialize each service node number is 0}
b) $flag \leftarrow true$
c) $while\ flag = true\ do$ {As long as the node number changed, the serial number will continue to adjust}
d) $flag \leftarrow false$
e) $for\ each\ e(i, j) \in E\ do$
f) $if\ index(j) \leq index(i) then$ {Ensure to number tail node side than the first node number}
g) $index(i) \leftarrow index(j) + 2$ {Node number adjustment}
h) $flag \leftarrow true$
i) $end\ if$
j) $end\ for$
k) $end\ while$
l) $for\ each\ index[i]\ do$
m) $t \leftarrow 0, sum \leftarrow 0$
n) $for\ each\ node\ v \in ty\ do$ {Find all the precursor nodes}
o) $if\ v\ has\ a\ service\ link\ to\ index[i]\ then$
p) $t \leftarrow t+1, sum \leftarrow sum + m[v]$ {The amount of data accumulated from all of its precursor and count}
r) $end\ if$
s) $end\ for$
t) $m[index[i]] = sum / t$ {The amount of data the precursor node all outgoing arithmetic average }
u) $end\ for$
v) $return\ m[O, S_{n-1}]$

Node splitting: To solve the shortest path algorithm is the single source weights at the edge of the shortest path problem, but our service on the node graph have cost (weight), so we need to make some transformation of service graph, which can be used the shortest path algorithm.

This method is used. For example, in Fig. 2, we will s_2 split into two nodes $s_{2,1}$ and $s_{2,2}$, then let all the precursor node s_2 are connected to the $s_{2,1}$, $s_{2,2}$ connected to all nodes of S2. Data processing delay raw to s_2 node above, now use between $s_{2,1}$ and $s_{2,1}$ the cost of edge to said, it is called such as between $s_{2,1}$ and $s_{2,2}$ for the internal side edge (inner-link). Our service in every node splitting process, adding a new node, eliminating the vertices above cost, the price converted services diagram exists only on the edge.

Reliability conversion: Due to the dynamic and mobility in pervasive environment, service replica node may fail. System requirements is to find a delay as small as possible, path of service and reliability as high as possible. The idea is to make the reliability of the parameters, the processing delay of the node.

The previous QoS related research work, a coefficient for each service internal edges in graph, the coefficient of reliability service node is an internal edge represents the inverse of E. After this treatment, the service replica node distribution coefficient of higher reliability coefficient is relatively small, low reliability of service replica node distribution the relatively large. These internal edge new delay cost is the original price multiplied by the respective coefficient, as processing delay internal edge new (Lee *et al*., 2007).

This process idea is straightforward: for the single source shortest path algorithm for the shortest path, a service copy reliability makes the low reliability of the inner side of the price is relatively high, the higher reliability of service copy internal edge cost becomes lower and the shortest path algorithm to select the the shortest path selection bias in service copy the higher reliability. That is to say, the service replica node reliability higher more easily by the algorithm. The LD/Rpath algorithm of time delay is small selected path, at the same time, high reliability, to achieve a balance between the two.

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:

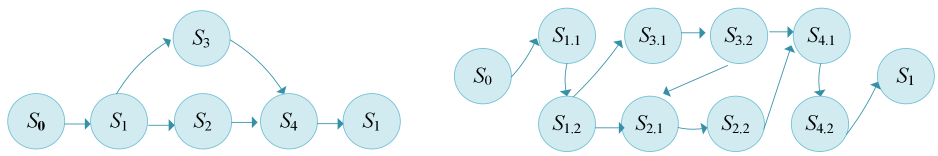
$$\frac{1}{e_i}.m.o_i \tag{4}$$

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:

$$\frac{m_i}{b_j} \tag{5}$$

Among them, b_j is the service bandwidth, m_i is the service on the edge of the approximate amount of data Transmission in food network system.

Figure 3 shows a simple conversion example. Figure 3a is a service graph, assume that the only 1 copies of each service service (similar to handle multiple copies), node splitting, converted to Fig. 3b. s_0 and s_t shown is the node of source data and the destination node.



(a) A service graph (b) Transformed service graph

Fig. 3: 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 Fig. 3b 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:

$$\frac{m.r_0.r_1.r_3}{T_{3,2}} \tag{6}$$

Composed of Transmission in food network system delay on the link between $s_{2,2}$ and $s_{4,1}$; on the side of price is as follows:

$$\frac{m.r_0.r_1.r_2 + m.r_1.r_0.r_2.r_3}{2T_{2,2-3,1}} \tag{7}$$

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 ss_0 by s_1 Transmission in food network system), the cost of data approximation; $s_{4,1}$ and $s_{4,2}$ between the inner side of the price:

$$\frac{1}{e_4} . \frac{m.r_0.r_1.r_3 + \frac{m.r_0.r_1.r_2 + m.r_1.r_0.r_2.r_3}{2}}{2} .o_3 \tag{8}$$

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.

CONCLUSION

Aiming at the problems in service oriented real-time multimedia Transmission in food network system, such as a long delay, frequent jitter and low reliability, this study 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 (Jangra *et al*., 2010). 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 innovations of this algorithm are as follows: the reliability is integrated into the edge weights reasonably, which guarantee the reliability in the choice of the shortest path; the reasonable approximate of data reduces the problem's complexity; node split integrates node weights into edge weights.

REFERENCES

Berangi, R., S. Saleem, M. Faulkner and W. Ahmed, 2011. TDD Cognitive Radio Femtocell Network (CRFN) operation in FDD downlink spectrum. Proceeding of the IEEE 22nd International Symposium on Personal, Indoor and Mobile Radio Communications, pp: 482-486.

Jangra, A., N. Goel, Priyanka and K. Bhatia, 2010. Security aspects in mobile ad hoc networks (MANETs): A big picture. Int. J. Electron. Eng., 2(1): 189-196.

Kchiche, A., F. Kamoun, S.A. Makram and M. Günes, 2008. A traffic-aware infrastructure-based architecture for inter-vehicules file sharing. Proceeding of the 2nd International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM), pp: 44-49.

Kloeck, C., H. Jaekel and F.K. Jondral, 2005. Dynamic and local combined pricing, allocation and billing system with cognitive radios. Proceeding of the 1st IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN), pp: 73-81.

Lee, K.C., S.H. Lee, R. Cheung, U. Lee and M. Gerla, 2007. First experience with CarTorrent in a real vehicular ad hoc network testbed. Proceeding of the Mobile Networking for Vehicular Environments. Anchorage, AK, pp: 109-114.

Mirza, M.J. and N. Anjum, 2012. Association of moving objects across visual sensor networks. J. Multimedia, 7(1): 2-8.