International Journal of Physical Education and Sports
ISSN: 2411-7242, Volume 3, Issue 1, June 2017

Research on Multimedia based on Transmission System Service

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Abstract: Multimedia transmission network has the characteristics of slow speed. For this defect, a multimedia based transmission system service research is put forward. According to the service level and cost of the system service provider, corresponding measures are taken to effectively save the cost of the development system

Keywords: Effectively save; Network; Transmission

1. Introduction

Qsen at running time rather than designed moment, because a lot of basic service's quality parameters are unavailable before running, and then he transforms the problem into linear optimization problem driven by quality [1-3]. Gu and the others propose an integrated P2P service composition framework---SpiderNet, which chooses service copies hop by hop through heuristic methods so as to satisfy the multiple quality requirements [4]. Besides, SpiderNet also guarantees the load balancing in certain degree. Considering the load balancing among service copies, Roman and the others proposes LIAC algorithm (further - inverse - the available capacity) so as to guarantee the load balancing among service copies in the choice of paths and the piggybacking mechanism is used to make LIAC more efficient. Roman and others also puts forward the service portfolio fault-tolerant system based on service network in the WAN. Kalasapur and the others propose a dynamic service composition framework using hierarchical service network to handle mobility and dynamic in pervasive environments [5].

Based on real-time multimedia transmission system, this paper inspects the service path's selection criteria of reliable multimedia transmission 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 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 paper that when the service requests are given, the appropriate service copies are selected to build multimedia transmission path with low latency and high reliability.

2. 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_1^2 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 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.

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

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 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.

$$t_j = \prod_{s_i \in t^{r_1}} \quad (2)$$

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" $\left(\frac{Delay}{\mathrm{Re}liability}, DIR\right)$ is taken as the goal of optimization.

$$(DIR)_p = \frac{\xi_p}{t_j} \quad (3)$$

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.

3. 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.

Choi et al proposed method of node splitting to translate some network problems. This method is used. For example, in figure 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 $s_{2,2}$ the cost of edge to said, it is called such as between $s_{2,1}$ and $s_{2,2}$ for the internal side edge (innerlink). 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.

3.1. 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.

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.

4. Experiment And Simulation

4.1. Evaluation Methods

There are two main experimental purposes: one is to evaluate the efficiency of LD/RPath algorithm, two is to evaluate the effect of selection algorithm. We have implemented two other algorithms to compare efficiency: one is random (random) algorithm, Random algorithm to select the service path, a successor node of the current node randomly selected as the processing nodes in the next step; two is the optimization (optimal) algorithm, Optimal algorithm traversing all possible paths, and then select the best path.

Comparison of results on the algorithm, we in different network size LD/RPath algorithm, Random algorithm and Optimal algorithm are executed many times, comparing the path they produce, respectively, compared with the 3 path delay, reliability and delay. Delay / reliable than smaller is better, better reliability, delay / reliable the smaller the better.

Huge computational complexity of Optimal algorithm makes it very time-consuming. In the real-time multimedia transmission system, the user can tolerate delay is relatively small, so Optimal algorithm in the service graph node scale up to a certain extent is not practical. So in our simulations, delay when the Optimal algorithm over a larger value after the operation efficiency and effect of selection, we only compare Random algorithm and LD/RPath algorithm.

4.2. Simulation Design

The simulation experiments on Inter (R) Core (TM) 2Duo CPU E8200 @ 2.66GHz, execute the 2GB RAM machine.

The simulation experiment using Java language, mainly includes the generation of various parameters services diagram and 3 kinds of algorithm. Parameters in the figure are designed to be adjustable, if we set the MaxNode=2000 service node. These service node, no multimedia processing service replicas initially, then according to the different network scale to produce functional diagram. For example, a MaxService=7 service in some settings, each service is at least MinInstance=3 copies, at

most MaxInstance=7 copy, then we randomly generate a connected graph function, for each service between MinInstance and MaxInstance generates a random real copy number, and then in the MaxNode node randomly selected some nodes to deploy services. Service copy of compression ratio, the service node unit processing time and reliability, link bandwidth according to a normal distribution, then the service. We can through the MaxNode, MaxService, MinInstance and MaxInstance parameters to scale adjustment services graph, comparative experiments were carried out in different network scale. In the design of 3 algorithms, Random algorithm is easy to implement, Optima L algorithm dynamically apply the memory to hold all the possible path, LD/RPath algorithm according to the 4 steps in the previous section of the processing.

4.3. Results of Analysis

The running time of 3 algorithms were compared in the topology of the network scale under different operation respectively. 3 kinds of algorithm 100 times, and then take the average execution time of 100 runs for comparison, as shown in Figure 4. We can see, the running time of LD/RPath algorithm and Random algorithm are much less than the optimal algorithm. When the network size is large, the running time of LD/RPath algorithm and Random algorithm are almost the same, therefore, the higher the efficiency of LD/RPath algorithm. In addition to the data shown in Fig., we also compared the running time of each algorithm is more large-scale network topology, node number reached 70, Optimal algorithm execution time was more than 80s. in a real-time multimedia transmission system, 80s delay is clearly not acceptable. So in the following experiments, when the number of nodes exceeds 70, we no longer consider optimal algorithm.

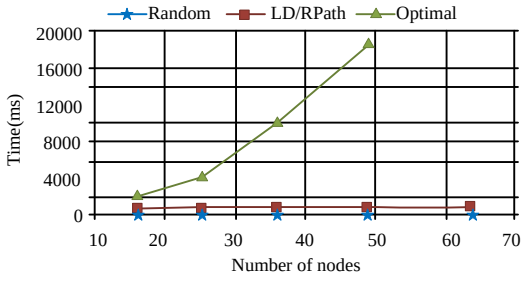

Figure1. The effect of 3 kinds of algorithms are compared in different network size

Then, the effect of 3 kinds of algorithms are compared in different network size. The experimental data shown in Figure 5 is the MaxService=7, MinInstance=2, MaxInstance=7 configuration. Under this configuration, we run 50 experiments in each experiment, the topological structure of network is to randomly generated, each experiment included 1 times 1 times LD/RPath algorithm, Optimal algorithm and Random algorithm 20 times, the results of the Random algorithm, the best results in 20 , time delay, reliability and delay / reliable ratio as shown in Figure 5.

Figure 2 (a) that is the 50 set of experiments, comparing 3 delay path generation algorithm. We can see, the LD/RPath algorithm is very close to Optimal algorithm, are better than Random-Best. statistical information discovery. In a 50 experiment, a 44 LD/Rpath delay path generated by the algorithm is smaller than the Random-Best algorithm, a the path with the Optimal algorithm to generate the same 24. Figure 5 (b) is the reliability comparison, in the 50 set of experiments, the reliability of route LD/RPath generated by the algorithm is 26 times more than the Random-Best algorithm, 1 have 6 times more than the Optimal algorithm. Figure 5 (c) is in contrast to delay / reliable ratio, delay / observe the path to produce LD/RPath and Optimal algorithm is very close to the reliable, are better than in most cases Random-Best algorithm. The results show that, in the 50 set of experiments, a Random-Best algorithm is better than the LD/RPath algorithm 42 times, 9 times better than Optimal algorithm.

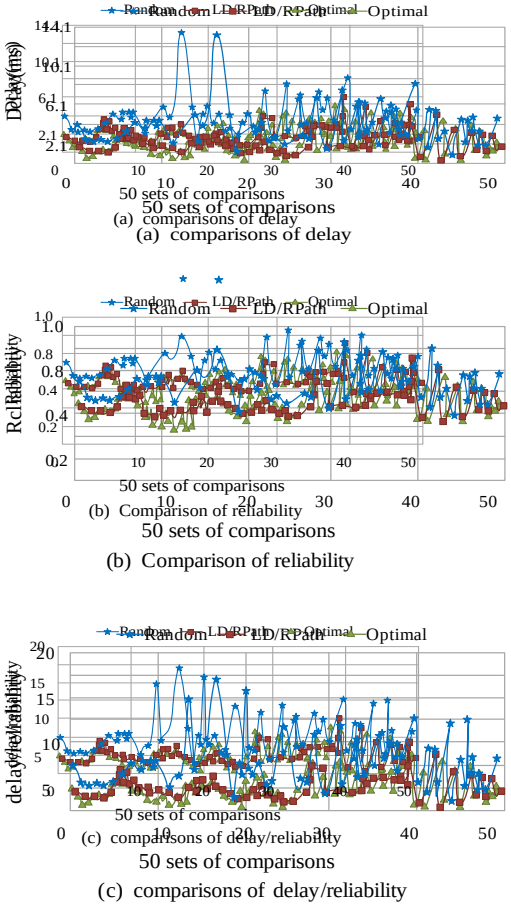

Figure2. 3 Kinds of algorithms the delay, reliability and delay / reliable than contrast

5. Conclusion

In the meantime, 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.

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