Journal of **Kim Il Sung** University
(Natural Science)

Vol. 4 No. 1
Juche104(2015)

One of the Methods to Determine the Network Monitoring Cycle in Consideration of the Network Load

Kim Song Il, Kim Yong Chol

Abstract This paper determined the network monitoring cycle dynamically using RT of TCP without measuring the return time of message through the transmission media to reduce the load of the network manager arising in the network monitoring of the centralized network management.

Key words network management, network monitoring, the cycle of the network monitoring

Introduction

The computer network management aims to monitor the computer network and control the network according to that result and so helps the network continue to run normally [1－7].

In other words, the network management is done at two stages-the network monitoring and the network control-the network control uses the result of the network monitoring.

So the network monitoring is the very important feature not only to get the information of the managing network state, but also to control the network.

What is important in the study of the network monitoring is that the information from the network monitoring reflects correctly the state of the monitored object and that the network flows from the network monitoring should have no influence on the network running.

In particular, in case of composing the centralized network management system, the packets which are transmitted for the network monitoring can be concentrated on the network manager's side and occurred the bottleneck phenomenon in the network of the network manager's side.

Therefore, the cycle of the network monitoring can be set shortly so that satisfying the actual time requirement of the obtained information of the state and not having a negative effect on the normal network service.

1. Determination of the Network Monitoring Cycle in Consideration of the Network Load

In general, the cyclical monitoring method of the static cycle is used for the computer network monitoring.

By the way, if the cycle is too long, it is impossible to get the information of the network state in real time.

Otherwise, the information communication quantity increases, resulting in a greater load to the network.

This requires adjusting the monitoring cycle dynamically according to the network's state.

It is necessary to determine the cycle dynamically according to the change in the response time or in the treatment load of network nodes.

The monitoring algorithm of such cycle can control the information communication amount for monitoring, reduce the resource consumption of algorithm and increase the speed.

But the calculation of the dynamic monitoring cycle gives a lot load to the node of the network manager.

Whenever calculating the monitoring cycle, it is necessary to investigate the response time or treatment load of all managed nodes first and calculate the different monitoring cycles on each node first and allocate them accordingly.

The greater the size of network management, the greater the load to the node of the manager due to the investigation and calculation and actually such load has a great influence on the actual network monitoring.

To solve this problem, the paper considered the following problem.

First, let's consider the network monitoring course.

The network monitoring is done as a course consisting of the following time factors.

$$T_{\mathrm{g}}^{m} \to T_{\mathrm{t}}^{m} \to T_{\mathrm{e}}^{a} \to T_{\mathrm{g}}^{a} \to T_{\mathrm{t}}^{a} \to T_{\mathrm{e}}^{m} \qquad (1)$$

This course is repeated for each monitored node.

$T_{\mathrm{g}}^{m}, T_{\mathrm{t}}^{m}, T_{\mathrm{e}}^{m}$ are the generation, transmission and analysis times of SNMP request message from the network manager. $T_{\mathrm{g}}^{a}, T_{\mathrm{t}}^{a}, T_{\mathrm{e}}^{a}$ are the generation, transmission and analysis times of SNMP response message from the network management agent.

Here, $T_{\mathrm{g}}^{m}, T_{\mathrm{e}}^{m}, T_{\mathrm{g}}^{a}, T_{\mathrm{e}}^{a}$ are the internal treatment times at the network nodes and T_{t}^{m}, T_{t}^{a} are the transmission time of the message through the transmission media and so we can obtain the following formulas.

$$T_{\mathrm{g}}^{m} \approx T_{\mathrm{g}}^{a}, T_{\mathrm{e}}^{m} \approx T_{\mathrm{e}}^{a}, T_{\mathrm{t}}^{m} \approx T_{\mathrm{t}}^{a} (\approx T_{\mathrm{t}}) \qquad (2)$$

$$T_{\mathrm{g}}^{m} \approx T_{\mathrm{e}}^{m},\ T_{\mathrm{g}}^{a} \approx T_{\mathrm{e}}^{a} \qquad (3)$$

$$T_{\mathrm{g}}^{m} \approx T_{\mathrm{e}}^{m} \approx T_{\mathrm{g}}^{a} \approx T_{\mathrm{e}}^{a} (\approx T_{msg}) \qquad (4)$$

And so

$$T_{msg} << T_{\mathrm{t}} \ . \qquad (5)$$

That is, the main time section at the network monitoring is a transmission time of SNMP message, T_{t}.

The feature of T_{t} are as follows.

• It is different from each other according to the condition of the network communication channel and it is different from each time for the same node. So this value was measured and used for the determination of the monitoring cycle in the calculation of the dynamic monitoring cycle.

• T_{msg} course between the network manager and a node can be done in parallel with T_{t} course between the network manager and other node.

• T_{t} course between the network manager and a node can be done in partial parallel with T_{t} course between the network manager and other node.

Next, let's consider RT of TCP.

TCP is recognized to be a reliable connective transmission control protocol.

This corrects the error of transmission by re-transmitting TCP segment and according how to define the starting point of the re-transmission, we can avoid the congestion while using the network transmission capacity to the maximum or not.

To determine the starting point of the re-transmission, TCP uses the re-transmission timer counter and the counter value that will be set in this re-transmission time counter is calculated and determined as follows.

First, we measure TCP segment's return time between two communicating nodes using option field of the TCP segment header.

And then, we calculate the value that will be set in this re-transmission time counter using that measured value.

$$RT_i = 2(\alpha \cdot RT_i^0 + (1-\alpha)RT_i^{'}) \tag{6}$$

where RT_i is a value of re-transmission time counter for the transmission with i^{th} node, RT_i^0 means TCP segment's return time with the last measured i^{th} node previously, $RT_i^{'}$ means a TCP segment's return time with the recently measured i^{th} node and α is 0.9.

Since TCP uses the value of the segment's return time that the network load is considered in the re-transmission time counter, it can avoid the congestion while using the network transmission capacity to the maximum.

From the consideration of the course and the feature of the network monitoring and of the feature of the counter value of TCP re-transmission time counter, the paper proposed a method of determining the network monitoring cycle that the network load is considered as follows.

It used RT_i value of TCP without measuring T_i in the calculation of the network monitoring cycle.

That is, we express the average time of the generation and the analysis of SNMP message of the network management system as T_{msg}, the number of the monitored nodes as n and the exchange time of SNMP message with the i^{th} node as RT_i —the TCP re-transmission time counter value and calculate the network monitoring cycle that will be used by the network management system in consideration of $T_{msg} < RT_i$.

$$T_{\mathrm{m}} = n \cdot T_{msg} + \frac{\sum_{i=0}^{n-1} RT_i}{n} \tag{7}$$

Practically, the network monitoring cycle can not be set shorter than the calculated T_{m}.

If the network monitoring cycle is set shorter than the calculated T_{m}, the error that the network manager treats the response to the request sent in the previous monitoring cycle can occur and the information communication quantity can be increased unnecessarily.

In the network management about the object that the real time requirement is not strong, we can set the network monitoring cycle longer than the calculated T_{m} in consideration of the information communication quantity.

If using such determined value with the monitoring cycle for the network management, we can reduce the load of the node of the network manager more than when using the calculation of network monitoring cycle by means of the measurement and obtain the enough information of the network state.

2. Assessment of the Method of Determining the Network Monitoring Cycle

Generally, the time of the dynamic cycle calculation for the network monitoring of the network manager can be given as follows.

$$T_{\mathrm{cyc}} = T_{\mathrm{tes}}^{\mathrm{rrt}} + T_{\mathrm{calc}}^{\mathrm{cyc}} \tag{8}$$

where $T_{\mathrm{tes}}^{\mathrm{rrt}}$ is time needed for the measurement of the return time of message and $T_{\mathrm{calc}}^{\mathrm{cyc}}$ is time for the real calculation of cycle.

In the paper, T_{cyc}^{*} is marked as follows.

$$T_{\mathrm{cyc}}^{*} = T_{\mathrm{acc}}^{\mathrm{rrt}} + T_{\mathrm{calc}}^{\mathrm{cyc}} \tag{9}$$

$T_{\mathrm{acc}}^{\mathrm{rrt}}$ is time needed to access RT value of TCP.

Where,

$$T_{\mathrm{tes}}^{\mathrm{rrt}} > T_{\mathrm{acc}}^{\mathrm{rrt}} \tag{10}$$

So

$$T_{\mathrm{cyc}}^{*} < T_{\mathrm{cyc}} \tag{11}$$

In other words, if we determine the network monitoring cycle dynamically using RT_i value of TCP, we can reflect the load of the network to manage in the network monitoring cycle and also reduce the load of the determination of the network monitoring cycle of the network manager's node.

That is, we can reduce the load of the quantity corresponding to $T_{\mathrm{tes}}^{\mathrm{rrt}} - T_{\mathrm{acc}}^{\mathrm{rrt}}$.

Conclusion

The network monitoring cycle can be determined dynamically using RT_i of TCP without measuring the return time of message through the transmission media to reduce the load of the network manager arising in the network monitoring of the centralized network management.

References

[1] 김용철; 콤퓨터망관리, 공업출판사, 16～26, 주체100(2011).

[2] 김용철; 정보기술, 2, 26, 주체101(2012).

[3] 김용철; 정보과학과 기술, 1, 9, 주체99(2010).

[4] William Stallings; SNMP Network Management, Addison Wesley, 23～53, 2001.

[5] B. A. Forouzan; TCP/IP Protocol Suite, McGraw Hill, 275～344, 2007.

[6] 李明江; SNMP简单网络管理协议, 电子工业出版社, 3～19, 2007.