

Claims

1. A multi-protocol routing system, which comprises a route determining module and a forwarding module which are located in the network layer, wherein:

the route determining module is used for determining, based on the relevant information of applications and networks, the type of the routable protocol and the next-hop path which are to be selected in current routing phase; and

the forwarding module, including different routable protocols and corresponding routing information, is used for periodically calculating the newest remaining network resources and the state of link during a routing process and updating the forwarding table in current state.

2. The multi-protocol routing system according to claim 1, wherein the information related to the applications includes the information about the features and the state of the applications, and specifically includes one of the content information, the requirements information, the related QoS (Quality of Service) information of other applications, operation state and other related state information, or the combination of two or more of the aforementioned information; the information related to the networks includes the information about the features and state of the networks, and specifically includes one of position information, link state information,

the information of related networks, or the combination of two or more of the aforementioned information.

3. The multi-protocol routing system according to claim 1, wherein: the route determining module specifically includes the following functions:

requesting the routing-related information of all the routable protocols maintained currently from the forwarding module, so as to obtain all the currently possible candidate paths as well as the network states information and resource occupying information corresponding to the candidate paths;

extracting, according to data messages or interaction data, the characteristic information of the applications and the characteristic performance target information of the applications;

determining a route; and

estimating, according to the above determining result, the new resource occupying condition of the related candidate routing paths after message is forwarded under the current network environment.

4. The multi-protocol routing system according to claim 3, wherein: the routing determining is realized by means of calculating a decision function.

5. A multi-protocol routing method realized on the multi-protocol routing system according to claims 1 to 4, comprises the steps of:

Step 1) a first router obtains the routing information related to

applications through interaction with a host computer or another router after receiving a network layer message from the host computer or the later router;

step 2) the route determining module in the first router selects the optimal routable protocol and path capable of meeting the characteristic performance targets of the current application according to the information obtained in step 1), the candidate paths obtained from the forwarding module, the network states and resource occupying condition information corresponding to the candidate paths; and the route determining module further estimates the new resource occupying condition of the candidate paths selected under the current network environment according to the decision result;

step 3) the first router selects the corresponding routable protocol and next-hop path according to the determining result of the route determining module, and then forwards the message; at the same time, the first router submits the determining result obtained in step 2) and a related estimated value to the forwarding module, which updates the corresponding resource state in the current routing table and rules according to the resource occupying condition during the forwarding process; and

step 4) the second router, after receiving the network layer message sent by the first router, un-packages the message, extracts and processes the

information from the interaction data through the route determining module in itself, including extracting characteristic performance targets and updating the performance requirements with the extracted characteristic performance targets after the last-hop forwarding procedure; if the characteristic performance targets are realized, then the routing process ends; or else, step 2) is re-executed.

6. The multi-protocol routing method according to claim 5, wherein: step 2) comprises the following steps:

step 2-1) the route determining module requests the routing related information about the M routable protocols maintained currently by the forwarding module, and then the forwarding module returns information including the resource condition of the possible next-hop path correspondingly maintained by each routable path, network state information and a routing table to the route determining module;

step 2-2) the route determining module, based on the data obtained in step 2-1) and step 1), selects the optimal routable protocol and path under the condition of meeting the characteristic performance targets of the applications; and

step 2-3) the route determining module, based on the determining result, estimates the new resource occupying condition of the selected candidate routing path under the current network environment.

Claims

1. A multi-protocol routing method realized on a multi-protocol routing system comprising a route determining module and a forwarding module which are located in a network layer of a computer network, wherein:

5 the route determining module is responsive to information related to applications and information related to networks for determining a type of routable protocol and a next-hop path which are to be selected in a current routing phase; and

the forwarding module having different routable protocols and
10 corresponding routing information, the forwarding module: periodically determining the current remaining network resources and a state of at least one link during a routing process; and updating a forwarding routing table to a current state;

the method comprising the steps of:

15 (1) a first router obtaining routing information related to applications through interaction with a host computer or another router after receiving a network layer message from the host computer or the another router;

20 (2) the route determining module in the first router selecting an optimal routable protocol and path capable of meeting characteristic performance targets of a current application

according to the information obtained in step (1), candidate paths obtained from the forwarding module, network states and resource occupying condition information corresponding to the candidate paths;

5 (3) the route determining module estimating a new resource occupying condition of the candidate paths selected under a current network environment according to a decision result;

(4) the first router selecting a corresponding routable protocol and next-hop path according to a determining result of the route
10 determining module, and then forwarding the message; at the same time, the first router submitting the determining result obtained in step (2) and a related estimated value to the forwarding module, which updates a corresponding resource state in the current forwarding routing table and rules according to the resource
15 occupying condition during the forwarding process; and

(5) a second router, after receiving the network layer message sent by the first router, un-packages the message, extracts and processes information from interaction data through the route determining module in itself, including extracting characteristic performance
20 targets and updating performance requirements with the extracted characteristic performance targets after a last-hop forwarding

procedure; if the characteristic performance targets are realized,
then the routing process ends; or else, step (2) is re-executed.

2. A multi-protocol routing method according to claim 1 wherein the
information related to applications includes information about features and
5 states of at least one application.

3. A multi-protocol routing method according to claim 2 wherein
information about the features and states of at least one application
includes one or more of: content information; requirements information;
QoS (Quality of Service) information of other applications; operation state;
10 and other related state information.

4. A multi-protocol routing method according to any one of the preceding
claims wherein the information related to networks includes information
about features and states of one or more networks.

5. A multi-protocol routing method according to claim 4 wherein the
15 information about features and states of one or more networks includes
one or more of: position information; link state information; and
information about related networks.

6. A multi-protocol routing method according to any one of the preceding
claims wherein the route determining module:
20 requests from the forwarding module routing-related information
of all the routable protocols maintained currently to thereby obtain

all the currently possible candidate paths, network states information and resource occupying information corresponding to the candidate paths;

extracts according to data messages or interaction data,

5 characteristic information of applications and characteristic performance target information of the applications;

determines a route; and

estimates, according to the above determined route, a new resource occupying condition of related candidate routing paths after a

10 message is forwarded under the current network environment.

7. A multi-protocol routing method according to claim 6 wherein: the routing determining is realized by means of calculating a decision function.

8. A multi-protocol routing method according to any one of the preceding

15 claims, wherein step (2) comprises the following sub-steps:

(2-1) the route determining module requests the routing related information about the M routable protocols maintained currently by the forwarding module, and then the forwarding module returns information including the resource condition of the possible
20 next-hop path correspondingly maintained by each routable path, network state information and a routing table to the route

determining module;

(2-2) the route determining module, based on the data obtained in sub-step (2-1) and step (1), selects the optimal routable protocol and path under the condition of meeting the characteristic performance targets of the applications; and

(2-3) the route determining module, based on the determining result, estimates the new resource occupying condition of the selected candidate routing path under the current network environment.