

Title	通信状況に応じて柔軟に経路再選択を行うマルチパスルーティングの提案
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Proposal of Multipath Routing for Flexible Route Re-Selection According to Communication Situation

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The Internet has been opened to the public for the first time in history since early 1990s. The services, such as official website of various organizations, electronic bulletin boards, search engines, video sharing sites typified by YouTube, Social Networking Service (SNS) typified by Facebook and Twitter, file sharing softwares typified by BitTorrent, Business to Business (B2B), block chain, Internet of Things (IoT), Machine 2 Machine (M2M) and Artificial Intelligence (AI), has been being developed. So the amount of data transfer on the Internet is continuously increasing.

Several algorithms related to multipath routing for load sharing have been proposed. However, these has the issues such as large order of calculation amount, slow convergence and low degree of freedom for path selection because there is a premise that routes are determined synchronously throughout the network. And these has difficulty in redetermining the route itself by adapting to the load at the same time.

Therefore, in this research, I propose multipath routing which can flexibly redetermine the communication route according to load change by applying Potential Based Routing (PBR). The proposed method is Multipath Potential Based Routing (MP-PBR). In the MP-PBR, MP-PBR calculate load adaptively, asynchronously and cooperatively throughout the

network by diffusion equation which behaves like lifting in response to load and forming a metric plane throughout the network. Therefore, MP-PBR makes possible to recalculate local routes according to load fluctuation. In each router, packets are dispersedly transferred by considering of the gradient of the metric plane. Because of such a method, MP-PBR has been migrated from a paradigm that strictly determines a route to the entire network as supported by the existing multipath routing and transfers the data packet to a paradigm that the data packet freely rolls on a curved surface where flexibly change shape.

I compare the throughput between terminals, protocol overhead, routing control overhead and path convergence speed between Open Shortest Path First Equal Cost Multi Path (OSPF-ECMP) and MP-PBR. As a result, it was found that MP-PBR has superiority over OSPF-ECMP with respect to throughput between terminals.

The MP-PBR proposed this time focuses only on the dispersion of the communication load and distributes traffic on a packet basis. As a consequence apart from the problem that packet reordering causes control disturbance in the transport layer, MP-PBR is suitable for a network that require throughput such as data center. Conversely, it seems that MP-PBR is basically unsuitable for a network in which real-time voice / image communication, remote control of a real-time actuator are the main use purposes. However, since the metric surface is formed in a conical shape in terms of macros, the gradient tends to always fall in a direction approaching the destination. Therefore, even if the data packet distribution like this time is executed, the data packet does not arrive at the destination after detouring by a very large amount. In addition, TCP can deal some packet reorders by Selective ACKnowledgment (SACK). Moreover, even if the above-described method can not cope with it, supplementing the missing data with a filter can continue the processing itself although the quality of the processing result is deteriorated.