

CLAIMS

WHAT IS CLAIMED IS:

1. A method, comprising:
receiving, from a user application, data to be transmitted from a source address
5 to a destination address through a network ;
splitting the data into a plurality of packets according to a communication
protocol; and
for each packet of the plurality of packets:
determining, from a plurality of flowlets, a respective flowlet for the
10 packet to be transmitted in;
setting, based on the determined flowlet for the packet, a protocol
optional field in the packet used by a network switch of the network to route the
packet; and
sending the packet via the determined flowlet for transmitting through
15 the network.
2. The method of claim 1, wherein the communication protocol is User
Datagram Protocol (UDP), and the protocol optional field in the header of the packet is a
source port field of a UDP header.
3. The method of any preceding claim, wherein each packet includes a
20 source IP address in an IP header, a destination IP address in an IP header, a FlowID field in
an IPv6 header, or a multiprotocol label switching (MPLS) label.
4. The method of any preceding claim, wherein each packet includes at
least one of a flowlet index or a packet sequence number.
5. The method of any preceding claim, further comprising maintaining
25 sequence numbers of active packets for each flowlet.
6. The method of claim 5, further comprising removing the sequence
number of a packet from the sequence numbers of active packets after transmission of the
packet or after receiving confirmation that the packet has been received at the destination
address.

7. The method of any preceding claim, wherein determining the flowlet for the packet to be transmitted in includes at least one of:

determining a number of active packets in each flowlet of the plurality of flowlets;

5 determining a latency of each flowlet of the plurality of flowlets;

obtaining a drop rate of each flowlet of the plurality of flowlets;

obtaining information of the user application; or

receiving an indication from the user application regarding how the plurality of packets are to be assigned to the plurality of flowlets.

10 8. The method of any preceding claim, further comprising:

transmitting packets in each flowlet of the plurality of flowlets to the network through one or more physical ports.

9. The method of claim 8, wherein transmitting the packets in each flowlet of the plurality of flowlets to the network includes selecting, from a plurality of

15 physical ports, a physical port through which each packet is to be sent based on information in the header of each packet.

10. The method of any preceding claim, wherein determining the flowlet for the packet to be transmitted in is based on values set in the field in the header of packets for data other than the data from the user application.

20 11. The method of any preceding claim, wherein a number of active packets in each flowlet is below a threshold, and wherein the threshold is adjustable based on network congestion.

25 12. The method of any preceding claim, further comprising assigning a flowlet and its associated packets to a different path through the network in response to a determination that the original path for the flowlet has a latency or a drop rate over a threshold value.

13. An apparatus, comprising:
a processing logic;
a computer readable storage device coupled to and readable by the processing logic, wherein the computer readable storage device includes instructions for causing the processing logic to:
- 5 receive, from a user application, a message to be transmitted from a source address to a destination address through a network;
split the message into a plurality of packets according to a communication protocol;
- 10 for each packet of the plurality of packets:
assign, from a plurality of flowlets, a flowlet for the packet to be transmitted in;
set, based on the assigned flowlet, a protocol optional field in the packet used by a network switch of the network to route the packet; and
- 15 send the packet via the assigned flowlet for transmitting through the network;
a memory coupled with and accessible by the processing logic, the memory being configured to store a plurality of queues of packets; and
one or more physical ports in communication with the network, wherein the plurality of packets are transmitted to the network through the one or more physical ports.
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14. The apparatus of claim 13, wherein each of the one or more physical ports has a unique IP address, and wherein each packet includes a source IP address field of an IP header.
15. The apparatus of claim 13 or 14, wherein the apparatus includes one of
- 25 a system-on-chip (SOC), a processor, a network interface card (NIC), a switch application specific integrated circuit (ASIC), or a field programmable gate array (FPGA).