**Extension of DHCPv4 for policy routing of multiple interfaces terminal**
**draft-hui-mif-dhcpv4-routing-03.txt**


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Abstract

   Current multiple interfaces terminal causes the problem of selecting
   a proper interface for a specific application, and this is a new
   question which will change the previous internet model. This document
   proposes a solution which extend DHCPv4 to carry the policy routing to
   map the IP flows to multiple interfaces.

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## 1. Introduction

Currently, the terminal always has multiple interfaces to connect to different types of access networks. The challenge is how to assign different IP flows to each interface, and ensure all the interfaces can deliver the flow simultaneously.

The operating systems only allow one default network connection now. If there are multiple connections of the host, all the flows will go to the default gateway based on RFC1122 description. One default gateway guarantees the host always has one entry to the network, but lead to the multiple connections be difficult. The most convenient way to make the host work under several networks at the same time is to add specific static route in the host route table, so that certain flow can use the assigned interface while others use the default one, but it is not easy for the ordinary users to handle it. We analyze this problem statement in another IETF draft 'draft-hui-ip-multiple-connections-ps-02'.

In this document we will illustrate the specific scenario and give a probable solution by extending DHCPv4.

## [2](#). Scenario

The usage of multiple interfaces is common. For example, the user has several applications run in his mobile terminal, and the terminal has multiple interfaces for different types of access technology such as WiFi and 3GPP LTE. It is important for the user to connect right access network for specific application. The problem is current internet model and protocol stack are not designed for multiple interface scenarios, for the mechanism of the mapping between application and multiple interfaces is lack.

In this draft a solution of policy routing is proposed to map the application to specific interface based on policies defined by users or operators.

## 3. Solution

In order to direct IP flows of the application to the right interface, DHCPv4 message can be extended to carry the routing policy, and the extension is added in the option field of the DHCP message.

### 3.1. Routing policy

The routing policy can be applied in the host so that different IP flows can go to different interfaces depending on the policy. To maintain a simple host routing table, the policy can be allocated by the network side, i.e. the gateway. The policy is distributed to the host as soon as it attaches to the gateway, and the policy will be applied in the initial procedure of the host.

The routing policy information should contain the proper interface allocation according to IP destination and service type. For doing this, IP flows can go to the appropriate network, and all connections can work simultaneously.

### 3.2. DHCP extension

DHCP is a proper message to carry the host routing policy information, for DHCP take effect when host first attach to the network, and DHCP is a universal protocol used in the host IP deployment between network gateway and host.

In the RFC2132, option 33 is defined as the static route option, which directs the IP flow to a router depending on the destination IP address. This is a kind of policy routing, but the destination IP address is not enough to indicate the relationship of IP flow and interface in nowadays complicated network deployment situation. More attributes are needed to determine a binding of application IP flow and interface.

To carry the host routing information, the extension of the DHCP option is showed as follow:

```
   Code    Len   Destination 1          Mask 1
   +-----+-----+-----+-----+-----+-----+-----+
   |  x  |  n  |  d1 |  d2 |  d3 |  d4 |  m1 |
   +-----+-----+-----+-----+-----+-----+-----+
   TOS1    Router1                Metric1
   +-----+-----+-----+-----+-----+-----+-----+
   |  t1 |  r1 |  r2 |  r3 |  r4 |  e1 |  d1 |
   +-----+-----+-----+-----+-----+-----+-----+
   Destination 2      Mask2  TOS2  Router2
   +-----+-----+-----+-----+-----+-----+-----+
   |  d2 |  d3 |  d4 |  m1 |  t1 |  r1 |  r2 |
   +-----+-----+-----+-----+-----+-----+-----+
            Metric2
   +-----+-----+-----+-----+
   |  r3 |  r4 |  e1 | ...
   +-----+-----+-----+-----+
```

Figure 1 DHCP extension format.

Code is an 8 bits number represents the specific DHCP option, which needs to be assigned by IANA.

Len represents the length of the option form the byte after the Len field, and it takes 8 bit.

Destination is the Destination IP address of the datagram, occupying 4 byte. Mask field represents the subnet mask digit of the destination.

TOS is 8 bit length which follows the definition in RFC1349, and it represents the requirement of specific IP flow, such as bandwidth and delay.

Router is the IP address of the network gateway which takes 32 bit length. Either the router interface address or the corresponding host interface address is suitable.

Metric is the measurement of the routing performance, it represent different types of value to measure the route, such as hops. The length of metric is 8 bit. The metric in host routing table means the bandwidth of the access network and the route has lower metric represents better performance. It will be useful when the route

   policies get from different interfaces conflict, if more than one
   route items have same destination and TOS but with different router
   address, the one has lower metric will be used.

### 3.3. Configuration procedure

   The DHCP routing policy is carried in the DHCP message, when host
   requires IP configuration as soon as it first attaches the network,
   DHCP server will send the routing policy together with the IP
   configuration to the host.

   Then the routing policy carried on the DHCP message is obtained by
   the host, and applied as the static routing entries in the host
   routing table.

   When it comes to the source address selection of the datagram, the
   host operating system will look up the routing table according to the
   destination IP address first, if it finds an available routing, the
   interface of this routing will be used to send out the datagram, and
   the IP address of this interface is selected to be the source address
   of the datagram. The detail of the source address selection is
   described in RFC1122 and RFC3484.

   So that the static routing entry can constrain specific IP flow to
   certain interface. Depending on the destination and TOS, the IP flow
   can find a proper router as the next hop, and goes out through the
   corresponding interface. Thus different IP flows can use multiple
   connections properly and simultaneously.

**4. Security Considerations**

This document doesn't propose any new protocol.

## 5. IANA Considerations

This document requires a new number for DHCP option code x described in section 3.2.

## 6. References

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