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Happy Eyeballs Extension for Multiple Interfaces
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Abstract

The memo has been proposed to extend happy eyeballs algorithm to fit into multiple interfaces environment. Based on this extended heuristic algorithm, a client with multiple interface could determine the optimal flow path in which specific interface has been chosen. Furthermore, an appropriate IP address family for each interface can be also identified to guarantee user experiences during IPv6 transition period.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on September 13, 2012.

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1. Introduction

In multiple interface context, the problems raised by hosts with multiple interfaces have been discussed. The MIF problem statement[I-D.ietf-mif-problem-statement] has described the various issues when using a MIF node on which multiple interfaces are used and results in wrong domain selection. Happy Eyeballs [I-D.ietf-v6ops-happy-eyeballs] has described how a dual-stack client can determine the functioning path to a dual-stack server. It's using heuristic algorithm help applications to quickly determine if IPv6 or IPv4 is the most optimal to connect to a server. That is a good method to achieve intelligent path selection. However, the assumption here is single-homed host. The interaction with multiple interfaces is still waiting for further study.

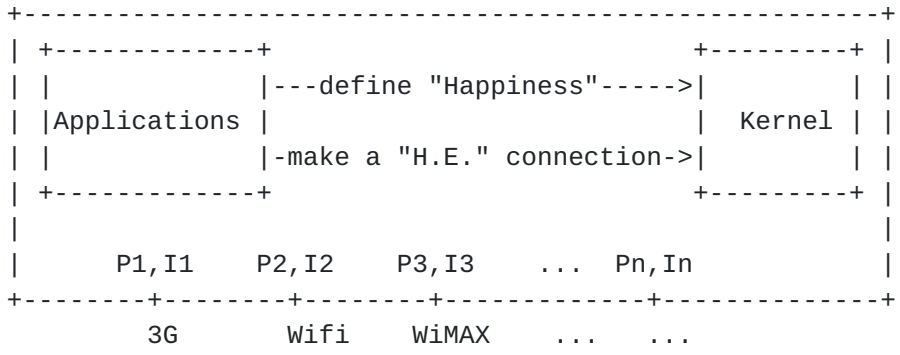
This memo has been proposed to extend happy eyeballs algorithm to fit into multiple interfaces environment. That could achieve win-win situation. Based on this extended heuristic algorithm, a client with multiple interface could determine the optimal flow path in which specific interface has been chosen. Furthermore, an appropriate IP address family for each interface can be also identified to guarantee user experiences during IPv6 transition period.

2. Heuristic Happy Eyeballs Extension Algorithm

The section details extended Happy Eyeballs algorithm, including defined framework, interface weighting consideration and and computation process.

2.1. The Framework for Extended Algorithm

The Figure 1 shows the proposed framework for extended algorithm.



MIF Happy Eyeballs Framework

Therein, several "Happiness" parameters have been defined and feeded

into applications. Applications would carry the parameters when they initiate the H.E. conncetion to remote peers. Different parameter sets would be chosen corresponding various demands from service or customer. The parameters should be understable by kernel. And respective system calls would be launched to choose an optimal interface. Regarding the interface selection, each interface will be configured with weighting coefficient, which is composed of pair values. Apart from value P, which is following current definition in [I-D.ietf-v6ops-happy-eyeballs], value I is defined to indicate preference of interfaces selection. In general, value I is responsible for interface selection; value P is a indication to identify IPv4 or IPv6 family has been preferred.

2.2. Happiness Parameters

The happiness parameters could be categorized in two groups.

- Hard preconditions: It's madatory indications that interface behaviour should comply with such preconditions guidance. The following factors belong to hard preconditions.
  - Operator policies: operators would deliver the customized policies in particular network environments due to charging or area regulation considerations.
  - User preferences: Users might configure to enable a specific interface to access network. for example, user may choose wifi interface to surf Internet considering low cost.
- Soft preconditions: It's optimal choice for transmitting data packages through a specific interface compared to others. The following factors would contribute soft preconditions justification.
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  - Routing policies: DHCPv6 Route Option [I-D.ietf-mif-dhcpv6-route-option] and RFC4191[RFC4191] allow configuration of specific routes and influence a nodes' ability to pick an appropriate route to a destination. A weighting for an interface headed to destination address that matches a specific route would be increased.
  - DNS selection: if improved DNS server selection [I-D.ietf-mif-dns-server-selection] takes effects, the wighting for those interfaces over which DNS suffix matching the requested name should also be increased.

* Other factors: There are many other factors could contribute optimal interface selection. This documents would like to focus on the main ones and treat others in a best effort manner. The key factors are expected to be added in future discussion.

2.3. Requirements for Implementations

The implementations of MIF HE modules should have a good transparency for applications and system kernel . The modules is responsible for two functionalities, i.e. HE syntax resolving and HE connection initiation . HE syntax resolving is capable of analyzing application demands and mapping to H.E. parameters. Resolved parameter may include "Hard" or "Soft" preconditions which are indicated in section 2.2. Afterwards, "Filter" and "Sort" are rules applied to make a step-wise processing . Depending on the judgement, the modules would initiate the connection to system kernel and choose a proper interface.

2.4. MIF HE Data Processing

According to the definition, applications would pass happiness parameters to kernel. Afterwards, system call would take account of value I to identify which interface has been chosen before sending out data packages .

The selection of a particular interface from the viable set implies a selection of one particular network path in preference to other viable paths. Interface weighting must be computed in advance but also be recomputed during session. The whole process for interface selection would offer the paramters with two kinds of priorities.

At stage I, upon the connection attempt, hard preconditions would be filtered , and then aggregate the results within that kind of "policy group".

At stage II, the soft preconditions should be applied to the resulted inteface set. According to particular soft preconditions, the prefered interface would be chosen by increasing I and delaying the connection attempts on the "undesirable" interfaces. This would allow to dial the preference between the different interfaces. The less desirable interface would get penalised a-priori.

When one interface defeats others, the corresponding value I will be set to positive value. Other interfaces will be set negative value. A value of 0 indicates equal weight for multiple interfaces.

When interface values I have been configured, the traffic flow

targeted to specific destination address or hostname will follow this guidance to choose proper interface. Hence, initial connection attempt would be sent over the interface that has matching particular rules and other interfaces would be tried only if no reply on the preferred one. Network condition may change during the session, interface reselection should be triggered. When connection problems are occurred to preferred connection, the value I need to be adjusted. The adjustment of value I will do polling-based scheme. The value I corresponding to suboptimal interface will be configured as positive. And previously optimal value I will be set to most-negative.

2.5. IPv4/IPv6 Selection Algorithm for Individual Interface

For a specific interface in a dual-stack single interface node, the choice of IP address family relies on Happy Eyeballs algorithm, which is defined in [I-D.ietf-v6ops-happy-eyeballs].

3. Additional Considerations

3.1. Usage Scope

Happy Eyeballs is trageting to HTTP context, but it is useful and applicable to other time-sensitive applications.

3.2. Flow Continuity

Usually, interface changing happens at the beginning of new session. So, there is no flow continuity issues for ongoing TCP sesson. Dynamic movement of traffic flows are addressed by other IETF protocols as well.

3.3. Default Address Selection

If more than one IPv6 address is assigned to the interface, the native IPv6 address is given preference.

4. IANA Considerations

This memo includes no request to IANA.

5. Security Considerations

TBD

6. Normative References

[I-D.ietf-mif-dhcpv6-route-option]
Dec, W., Mrugalski, T., Sun, T., and B. Sarikaya, "DHCPv6 Route Options", draft-ietf-mif-dhcpv6-route-option-04 (work in progress), February 2012.

[I-D.ietf-mif-dns-server-selection]
Kato, J., Lemon, T., and T. Savolainen, "Improved DNS Server Selection for Multi-Interfaced Nodes", draft-ietf-mif-dns-server-selection-07 (work in progress), October 2011.

[I-D.ietf-mif-problem-statement]
Blanchet, M. and P. Seite, "Multiple Interfaces and Provisioning Domains Problem Statement", draft-ietf-mif-problem-statement-15 (work in progress), May 2011.

[I-D.ietf-v6ops-happy-eyeballs]
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[RFC4191] Draves, R. and D. Thaler, "Default Router Preferences and More-Specific Routes", RFC 4191, November 2005.

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