Tunnel Type Change for Mobile IPv4

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Context

- Vehicular communications for public transportations;
- WiFi in the bus
- Mobile IPv4, NAT Traversal, IP-in-IP, IP-in-UDP
- Handover WiFi – 3G+, private – public space
Tunnel Types (conceptual)

IP-in-IP RFC 2003, 3G+, public IP address as CoA

IP-in-UDP RFC 3519, WiFi, private IP address as CoA
Tunnel Parameter Changing, Type is important (implementation)

- At MR and at HA, tunnel parameters updated upon handover:
  - “local address” (CoA, HA), “remote address” (HA, CoA);
  - address on the tunnel (HoA, HA);
  - route entry in the routing table, of tunnel;
  - default route’s dev (hso0, wifi1, eth0);
  - the type of tunnel (IP-in-UDP or IP-in-IP)?

- Changing *some* parameters, in *some* order, is friendly to the tunnel (it continues living); otherwise it kills the tunnel and the session.
The Problem

- Essence of the problem:

The problem stems from the impossibility of the HA to **dynamically change the encapsulation type** of a virtual interface which is already established. Hence, the HA is not able to re-use the previously established tunnel and a new virtual interface needs to be established.
Practical effects of the problem

• Some HA implementation
• MR hands over from WiFi to 3G+:
  – RegReq on 3G+ is dropped; needs to create new tunnel.
• MR hands over from 3G+ to WiFi:
  – “garbage” default route.
• problems:
  – asymmetric traffic (upload on WiFi, download on 3G+),
  – flip-flop dancing traffic WiFi-3G+,
  – use IP-in-UDP (larger than IP-in-IP) even on non-NAT,
  – utter session interruption.
Spec part of the problem: RFC5944 [MIP4]

In specification, when reading RFC5944 "Mobile IPv4", it is not clear whether or not the MN is allowed to request dynamically changing the type of a tunnel, once a registration is already present at the HA. The document does allow the use of various types of encapsulation (presumably when no registration present), but it is not clear whether a change in type is allowed, or forbidden, once a registration is already in place. Besides, RFC5944 [MIP4] does not specify the use of IP-in-UDP.
Spec part of the problem: NAT traversal, RFC3519

Encouragingly, RFC3519 states that: "When using simultaneous bindings, each binding may have a different type (i.e., UDP tunnelling bindings may be mixed with non-UDP tunnelling bindings)."

This may be interpreted as that the intention of RFC3519 is for HA to maintain simultaneously multiple tunnels for a unique Home Address (for example an IP-in-IP tunnel and a IP-in-UDP tunnel). If done, in some implementation, this leads to a difficulty of the forwarding algorithm to choose the outgoing interface, because the distinctive factor (Home Address) is the same for the two interfaces.
**RFC3519 2\textsuperscript{nd} problem: “decline” IP-in-UDP if no-NAT**

**RFC3519**: ”HA should decline a request to register IP-in-UDP tunnelling when the RegReq's addresses match”, unless F flag. The only error code is "64 reason unspecified".

![Diagram showing the interaction between MR and HA during the registration process when no-NAT is involved.](attachment:slide10.png)
Solutions

• Clarify specs MIP4 and RFC3519

• MR send “de-register” before a new “register” [*]

• MR/HA to consider locally whether a change in type of tunnel is needed

• Extend RegReq with TTC flags
WG feedback

• Are spec clarifications sufficient?
• Are new bits in RegReq needed?
• Are software enhancements on MR and HA sufficient?
• Is it ok to request a deletion followed by new reg, for handover wifi-3g? [*]?
• Any other comment: wifi-3g nat-nonat mip4 handover problems?