Tunnel Type Change for Mobile IPv4

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`draft-petrescu-mip4-tuntype-change-00`

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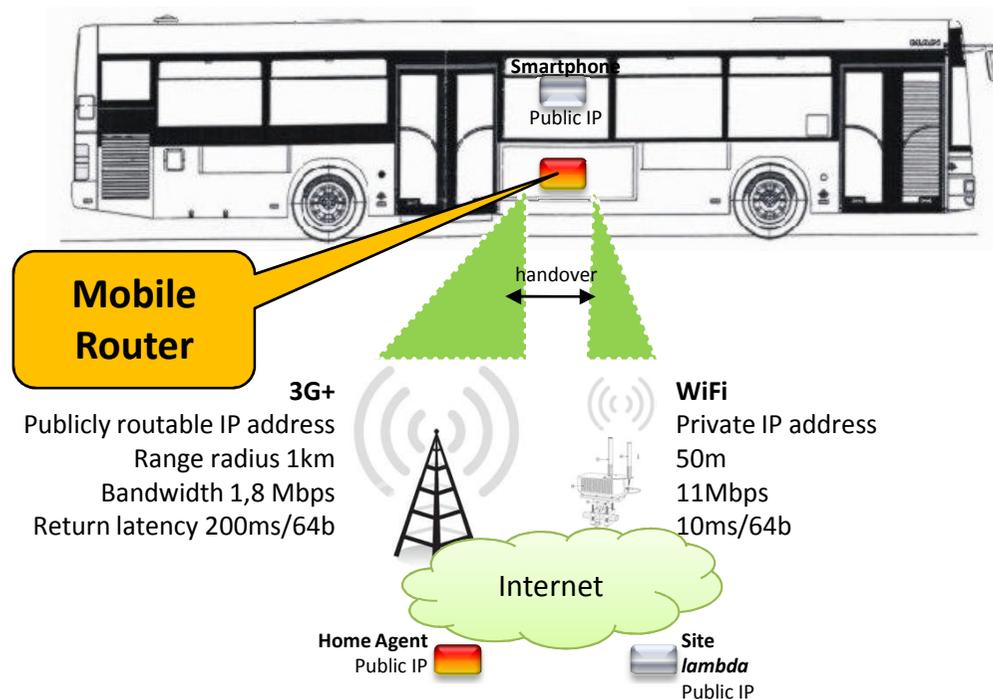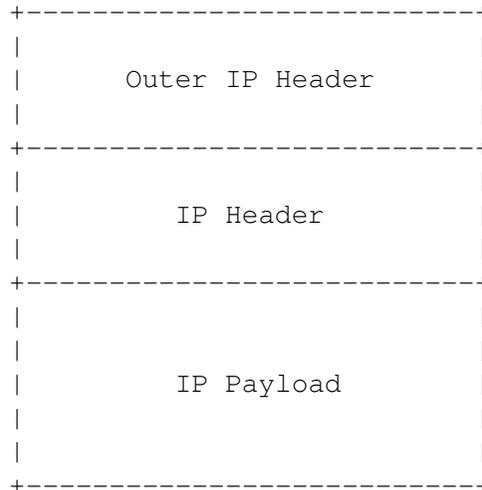IETF 80, 25yr

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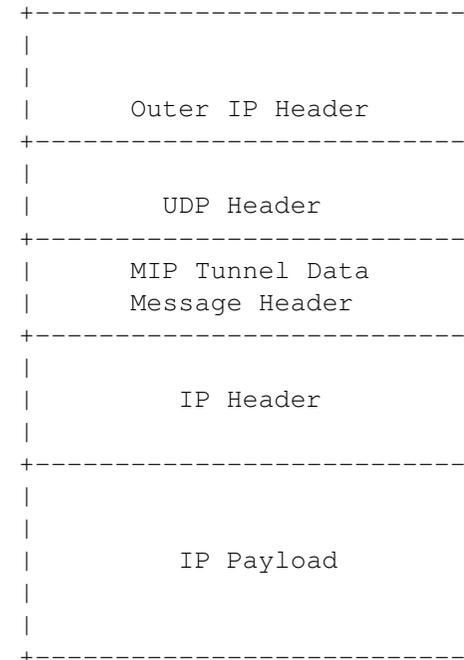- Possible solutions
- WG feedback?

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)

```
+--------------------------+
|                          |
|                          |
|     Outer IP Header      |
|                          |
+--------------------------+
|                          |
|                          |
|        IP Header         |
|                          |
+--------------------------+
|                          |
|                          |
|        IP Payload        |
|                          |
|                          |
+--------------------------+
```

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

```
+--------------------------+
|                          |
|                          |
|     Outer IP Header      |
+--------------------------+
|                          |
|        UDP Header        |
|                          |
+--------------------------+
|     MIP Tunnel Data      |
|     Message Header       |
+--------------------------+
|                          |
|        IP Header         |
|                          |
+--------------------------+
|                          |
|                          |
|        IP Payload        |
|                          |
|                          |
+--------------------------+
```

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.
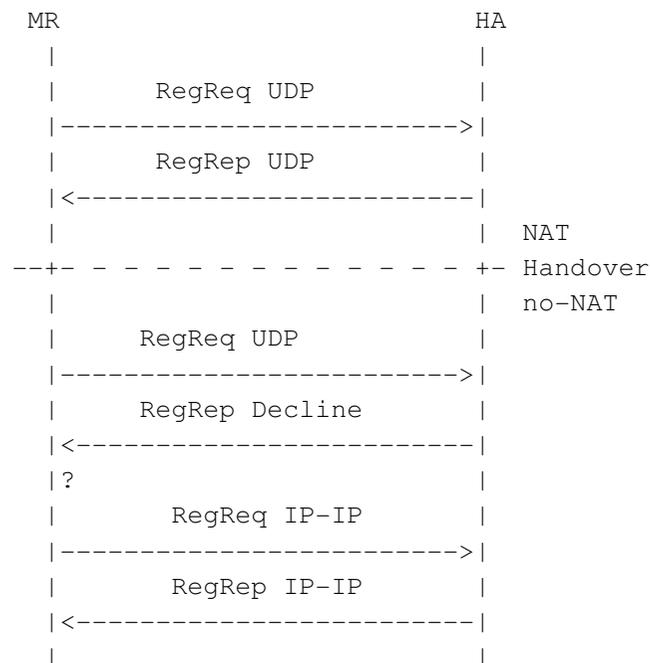
Spec part of the problem: NAT traversal, **RFC3519**

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 2nd 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".

```
    MR                              HA
     |                               |
     |          RegReq UDP           |
     |------------------------------>|
     |          RegRep UDP           |
     |<------------------------------|
     |                               | NAT
  --+- - - - - - - - - - - - - +- Handover
     |                               | no-NAT
     |          RegReq UDP           |
     |------------------------------>|
     |         RegRep Decline        |
     |<------------------------------|
     |?                              |
     |          RegReq IP-IP         |
     |------------------------------>|
     |          RegRep IP-IP         |
     |<------------------------------|
     |                               |
```

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**?