IP Mobility Orchestrator

draft-yegin-ip-mobility-orchestrator-00

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Categorization of Session Continuity Solutions

Solution	Category
App-layer (proprietary) techniques	Above-IP (end-to-end) solutions
SIP	
SCTP	
MPTCP	
Mobile IP	IP layer solutions
MOBIKE	
Proxy Mobile IP	Sub-IP solutions
LISP	
GTP	

Observation: Tradeoff
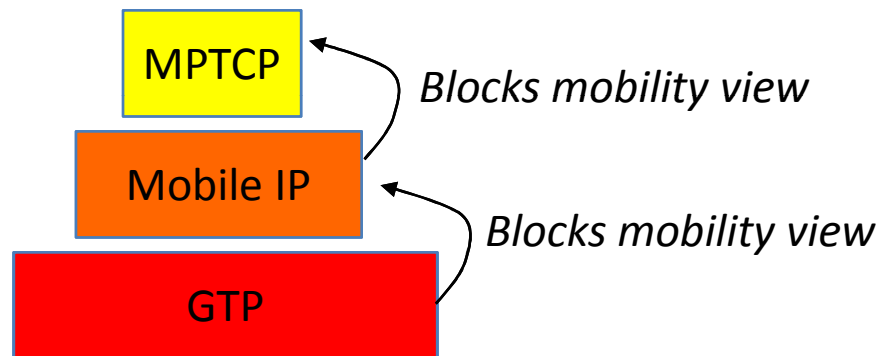
	Sub-IP	IP	Above-IP
Availability on node/network	Variable	Variable	Variable
Optimal data path setup	No (triangular)	No (triangular)	Yes (end2end)
Seamless handovers	Yes (access network anchoring)	Yes (access network anchoring)	No (*)

Suggests using solutions in combination to achieve aggregate benefits, but....

(*) Assuming single-radio terminal as a general case.

Observation: Blocking

Lower-layer solutions inhibiting operation of higher-layer solutions...

```
┌─────────┐
│  MPTCP  │ ←──────  *Blocks mobility view*
├─────────────┐
│  Mobile IP  │ ←──────  *Blocks mobility view*
├─────────────────┐
│      GTP         │
└─────────────────┘
```

Suggests coordinated execution (orchestration)...

Example

Using e2e MPTCP with PMIP in access network

CN

Internet

MPTCP: initiate sub-flow (IP2)

MPTCP: terminate sub-flow (IP1)

s-GW

temporary tunnel

t-GW

IP1 $\in$ s-GW

IP2 $\in$ t-GW

MN

Basic Flow

```
Mobile                                          Corresponding
 Host                           t-GW     s-GW        Host
  |                               |        |           |
  |<---1. configure IP1--------------------->|         |
  |                               |        |           |
  |<...2. start e2e IP flow ...............o.........>|
  |                               |        |           |
* 3. attach to t-GW              |        |           |
  |                               |        |           |
  |<---4a. configure IP2------->|         |           |
  |                               |        |           |
  |<---4b. retain IP1--------->|<--------->|          |
  |<...........................o==========o.........>|
  |                               |        |           |
  |<---5. MPTCP (s/IP1/IP2)-------------------------->|
  |<...........................o.....................>|
  |                               |        |           |
  |<---6. release IP1--------->|<--------->|          |
  |                               |  ===X== |          |
  |                               |        |           |
```
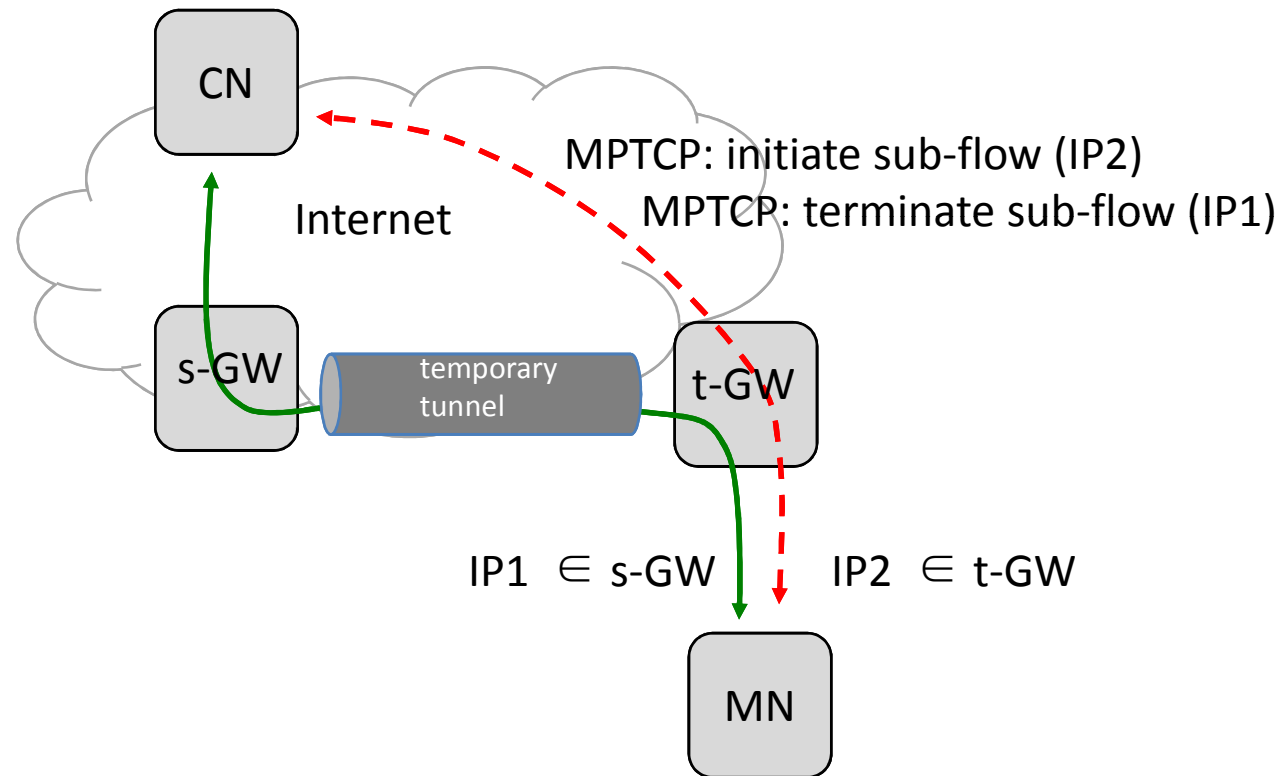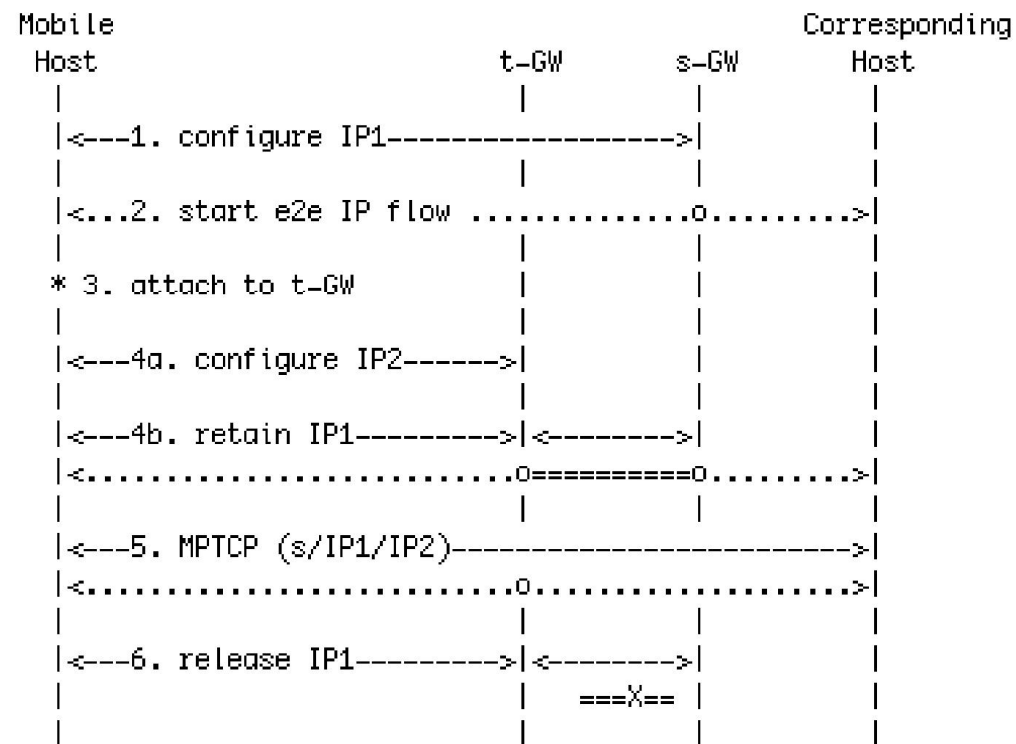
IP Mobility Orchestrator

- A functional entity residing on the terminal, in charge of:
  - Discovering terminal's mobility capabilities
  - Discovering network's mobility capabilities
  - Discovering corresponding host's mobility capabilities
  - Selecting primary and secondary mobility protocols on a *per-flow basis* (e.g., MPTCP + PMIP)
  - Coordinating execution of primary+secondary protocols at each IP handover

```
Mobile                                           Corresponding
Host                            t-GW    s-GW    DNS    Host
 |                               |       |       |       |
 * 1. discover host mob.cap.     |       |       |       |
 |                               |       |       |       |
 * 2. attach to s-GW             |       |       |       |
 |                               |       |       |       |
 |<--3a. configure IP1 ---------------->|        |       |
 |                               |       |       |       |
 |<--3b. discover access.net.cap------->|        |       |
 |                               |       |       |       |
 * 4. app attempts connection    |       |       |       |
 |                               |       |       |       |
 |<--5a. resolve IP@ of cor.host--------------->|        |
 |                               |       |       |       |
 |<--5b. discover cor.host mob.cap------------->|        |
 |                               |       |       |       |
 * 6. select mob. protocols      |       |       |       |
 |                               |       |       |       |
 |<..7. start e2e IP flow ..............o............>|
 |                               |       |       |       |
 * 8. attach to t-GW             |       |       |       |
 |                               |       |       |       |
 |<--9a. discover acc.net.cap->|         |       |       |
 |                               |       |       |       |
 |<--9b. configure IP2-------->|         |       |       |
 |                               |       |       |       |
 |<--9c. retain IP1----------->|<----->|         |       |
 |<............................o=======o............>|
 |                               |       |       |       |
 |<--10. MPTCP (s/IP1/IP2)---------------------------->|
 |<............................o...................>|
 |                               |       |       |       |
 |<--11. release IP1---------->|<----->|          |       |
 |                               | ==X== |        |       |
 |                               |       |       |       |
```

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Mobility Protocol Selection Algorithm

```
If there is an above-IP protocol common to both the mobile and
   corresponding host for the given flow type

   Select one of the common protocols as Primary Mobility Protocol

   If access network supports IP or sub-IP protocols

       Select one as Secondary Mobility Protocol

   Else

       There is no Secondary Mobility Protocol

Else

   If network supports IP or sub-IP protocols

       Select one as Primary Mobility Protocol

       There is no Secondary Mobility Protocol

   Else

       There is no Primary&Secondary Mobility Protocol
```

Executed on a per-flow basis, before the flow begins

Favors e2e solutions, hence provides distributed mobility management

Handover Algorithm

```
If any mobility protocol is used

    If only a IP/sub-IP protocol is used

        Request IP address anchoring

    Else

        If only above-IP primary protocols used w/o any secondary
            protocols

            Release the old IP address from old GW

            Configure a new IP address from serving GW

            For each primary mobility protocol

                Execute primary protocol handover using new IP addr.

        Else /* mix of IP/sub-IP and above-IP protocols used */

            Request IP address anchoring with old GW

            Configure a new IP address from serving GW

            For each primary mobility protocol

                Execute primary protocol handover using new IP addr.

            If no flow using IP/sub-IP as primary mobility protocol

                Release the old IP address from old GW

Else /* no mobility protocol is used */

    Release the old IP address from old GW

    Configure a new IP address from serving GW
```

Executed by terminal at system
level during each IP handover

Questions and comments?