Changes on 802.16e Working Document for IP Address Allocation by Mobile IP

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Purpose:

The document is submitted for review by Handoff/Sleep Mode Ad Hoc Group and/or by 802.16 Working Group Members

IP Address Allocation by Mobile IP (IEEE C802.16e-03/44)

2003-09-07

Electronics and Telecommunications Research Institute (ETRI)

Introduction

- **Motivation**
  - **Is seamless handoff to dynamic address users possible ?**
  - **In 802.16e Working Document, RFC 3344 adopted as the reference for Mobile IP.**
  - **How to transmit Mobile IP messages in IEEE 802.16e ?**

- **Objective**
  - **Seamless handoff to dynamic address users by Mobile IP**
  - **Mobile IP messages transmission between an MSS and a BS via the secondary management connection**

Problem Statements

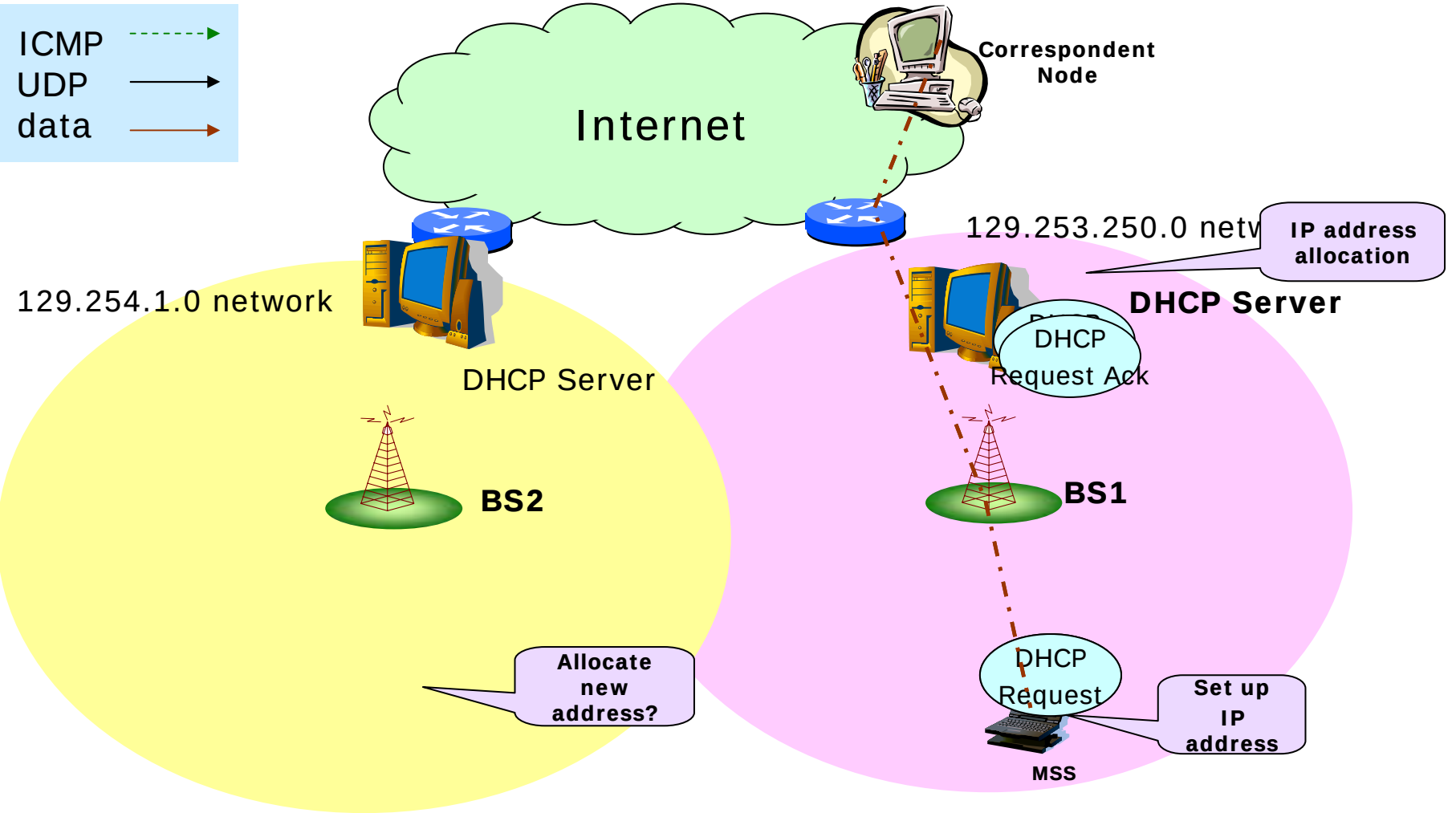
1. **When the MSS moves across the BSs after IP address allocation by DHCP**
   - **Unable to continue Internet connectivity**

     → **After movement across the subnets, the IP address of the SS is reallocated by DHCP in a new BS area.**

     → **Provides no seamless service.**

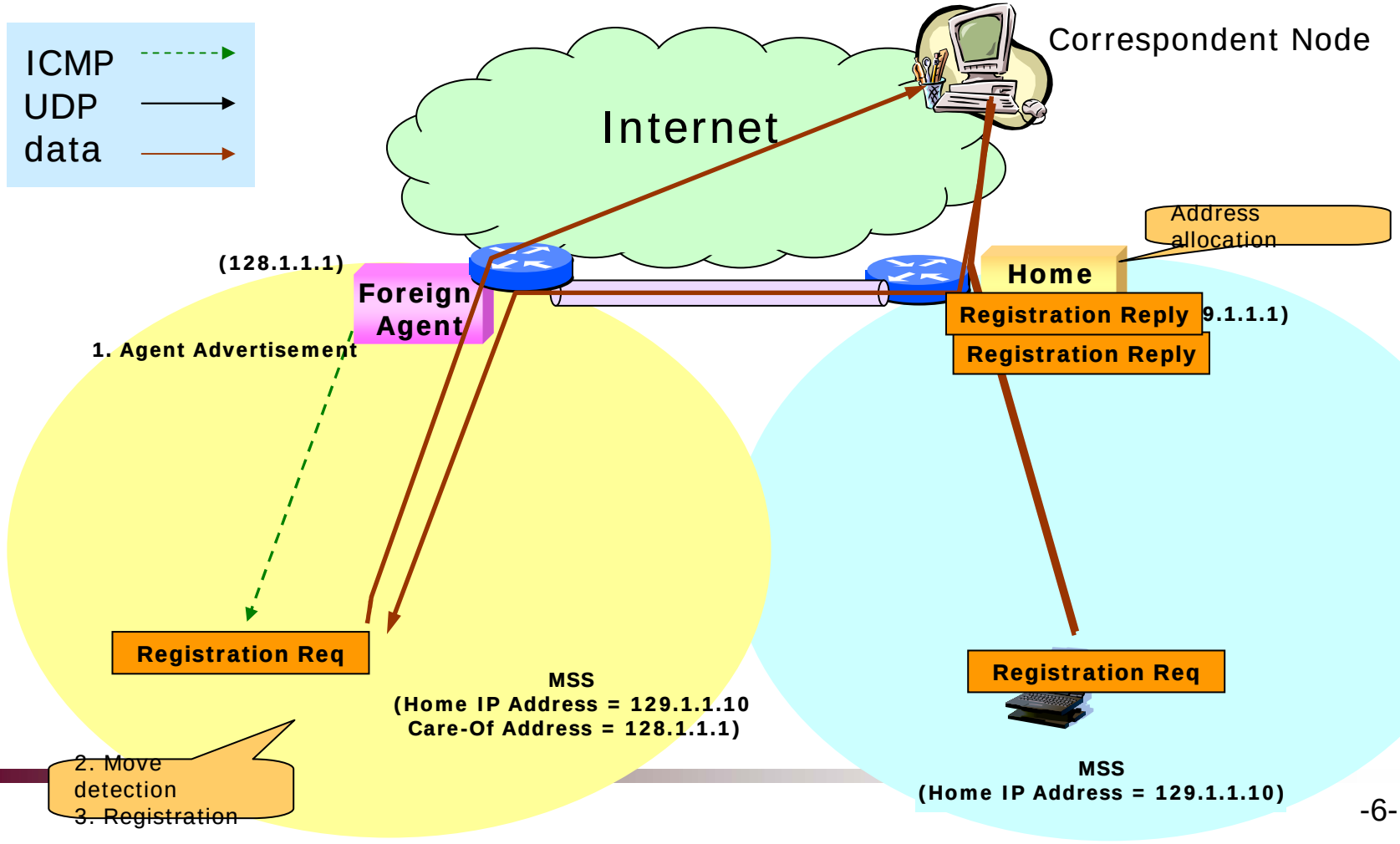
2. **Which connection is used for transferring Mobile IP messages ?**
   - **Not specified about the connection for Mobile IP in IEEE802.16e**
   - **A transport connection for user data or the secondary management for Mobile IP?**

P1. DHCP and IP mobility?



Our proposal to solve the problem 1

- **IP Address allocation by Mobile IP.**



P2. Which connection is used for Mobile IP messages?

- Not specified about the connection for Mobile IP in IEEE802.16e
- Transport connection or secondary management connection?
  - Is it possible to use a transport connection?
    - In case of IP address allocation by Mobile IP → Impossible
      - Must be established a transport connection before IP addresses allocation by Mobile IP.
      - → problems
        - » Can't set MSS's IP address related parameter in DSA-REQ for establishing a transport connection
    - Increase handoff delay time between inter-BS
      - Must be established a transport connection before transferring Mobile IP messages
    - An additional CID for Mobile IP per MSS is needed

Our proposal to solve the problem 2

- Transfer Mobile IP messages via secondary management connection
  - In case of IP address allocation by Mobile IP → Possible
    - Similar to IP addresses allocation by DHCP in IEEE 802.16
  - Advantages
    - Less handoff delay than using a transport connection.
    - Less the number of CIDs needed than using transport connections.

Contribution in IEEE 802.16e

- **Proposed Items**
  1. **Secondary management connection to transfer Mobile IP messages between an MSS and a BS**
  2. **Change of IP version parameter in REG-REQ to distinguish IP address allocation by DHCP and Mobile IP**
  3. **Basic Mobile IP procedures for establishing IP address**
  4. **Mobile IP configuration**

- **Advantage**
  - **Compatibility with IEEE 802.16**
  - **Minor Changes in existing IEEE 802.16e**
  - **Seamless handoff for dynamic IP users**

Mobile IP Messages transfer

- **The Secondary Management Connection between an MSS and a BS.**

- ***Changes 6.2.1 to the followings***

Finally, the Secondary Management Connection is used by the BS and SS to transfer delay tolerant, standard based (Dynamic Host Configuration Protocol (DHCP), Trivial File Transfer Protocol (TFTP), SNMP, etc.) management messages" to "Finally, the Secondary Management Connection is used by the BS and SS to transfer delay tolerant, standard based (Dynamic Host Configuration Protocol (DHCP), Mobile IP ,Trivial File Transfer Protocol (TFTP), SNMP, etc.) management messages.

Change of IP version TLV in REG-REQ/RSP

- **IP version negotiation**
  - **in REG-REQ step**
  - **Current IP version**
    - **IPv4 or IPv6**
  - **IP address allocation by Mobile IP**
    - **Add IP version parameter to Mobile IPv4 flag in REG-REQ**

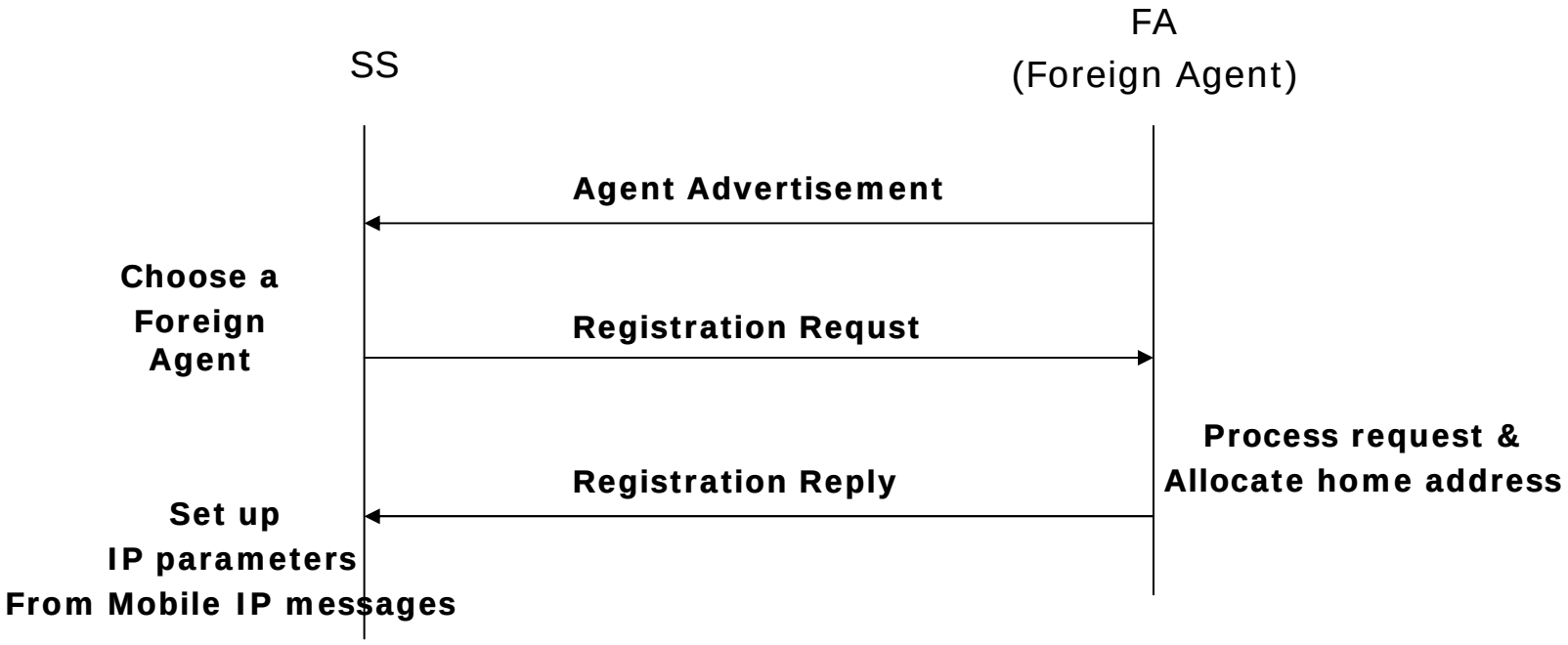
- ***[in 6.2.9.9.1]***

The SS may include the IP Version (11.4.1.7) parameter in the REG-REQ to indicate which versions of IP it support on the Secondary Management Connection. When present in the REG-REQ, the BS shall include the IP Version parameter (11.4.1.7) in the REG-RSP to command the SS to use the indicated version of IP and/or Mobile IP on the Secondary Management Connection. The BS shall command the use of exactly one of the IP versions supported by the SS.

IP Version parameter consists of the bitmap-fields; IPv4, IPv6, and Mobile IPv4.

Establish IP connectivity by Mobile IP

- ***[Add Under 6.2.9.10.1]***
  - **At this point, the Foreign Agent (FA) shall invoke Agent Advertisement message, and then the MSS shall invoke Mobile IP registration [IETF RFC 3344] in order to obtain an IP address and any other parameters needed to establish IP connectivity. The Mobile IP registration response message shall contain the MSS's IP address and a home agent address of the MSS and other configuration information. Establishment of IP connectivity shall be performed on the MSS's Secondary Management Connection ; see Table 62-b**



Mobile IP Configuration

- *[Add Under 9.1]*

9.2 Mobile IP Configuration

9.2.1 Mobile IP fields used by the MSS

The following fields shall be present in the Mobile IP registration request from the MSS and shall be set as described below and encoded according to IETF RFC 3344.

a) When the MSS (or Mobile Node (MN)) attempts to obtain an IP address dynamically, home address field shall be set to "0.0.0.0".

b) When the MSS (or MN) attempts to obtain an IP address in the visited network, the home agent address field shall be set to "0.0.0.0". On the other hand, when the MSS (or MN) attempts to obtain an IP address in the home network, the home agent address field shall be set to "255.255.255.255".

c) The Network Access Identifier (NAI) extension [IETF RFC 2789] shall be included for identifying the Mobile IP user.

d) The Challenge extension shall be included [IETF RFC 3012], if the Challenge extension is included in the Agent Advertisement message .

e) A 128-bit key may be shared between an MSS (or MN) and an AAA server during the initial Mobile IP registration, and the MSS (or Mobile Node)-AAA Authentication extension may be generated based on the shared key [IETF RFC 3012].

The following fields are expected in the Mobile IP registration response returned to the MSS. The MSS shall configure itself based on the Mobile IP registration response.

a) The home address to be used by the MSS.

b) The MSS's NAI extension to identify a Mobile IP user [IETF RFC 2789].

c) The challenge extension if the foreign agent supports more strongly security,

d) The MSS (or Mobile Node) and home agent authentication extension for authenticating the home agent.

e) The key reply extensions for security between the MSS and the HA, and between the MSS and FA, if the MSS requests keys between the MSS and the HA, and between the MSS and the foreign agent,.

IP Version Negotiation

- **Adds IP version parameter to “Mobile IPv4”**

- ***[in 11.4.1.7]***
  - **This field indicates the version of IP and/or Mobile IP used on the Secondary Management Connection.**

Type	Length	Value	Scope
5.9	1	bit #0: IPv4 bit #1: IPv6 bit #2: Mobile IPv4 bit#3-7:reserved; shall be sent to zero	REG-REQ, REQ-RSP

Conclusion

- **Seamless handoff between BSs for dynamic IP users**
  - **→ IP addresses allocation by Mobile IP**
- **Transferring Mobile IP messages via the secondary management connection**
- **Compatibility with IEEE 802.16 by a simple flag addition**
- **More perfect adaptation for Mobile IP**