

Network Working Group  
Request for Comments: 4332  
Category: Informational

K. Leung  
A. Patel  
Cisco Systems  
G. Tsirtsis  
Flarion Technologies  
E. Klovning  
Birdstep Technology ASA  
December 2005

## Cisco's Mobile IPv4 Host Configuration Extensions

### Status of This Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

### Copyright Notice

Copyright (C) The Internet Society (2005).

### IESG Note

This RFC is not a candidate for any level of Internet Standard. The IETF disclaims any knowledge of the fitness of this RFC for any purpose and in particular notes that the decision to publish is not based on IETF review for such things as security, congestion control, or inappropriate interaction with deployed protocols. The RFC Editor has chosen to publish this document at its discretion. Readers of this document should exercise caution in evaluating its value for implementation and deployment. See RFC 3932 for more information.

This RFC does not offer any security mechanisms to provide data origin authentication and integrity, yet these security services are vitally important in this context.

### Abstract

An IP device requires basic host configuration to be able to communicate. For example, it will typically require an IP address and the address of a DNS server. This information is configured statically or obtained dynamically using Dynamic Host Configuration Protocol (DHCP) or Point-to-Point Protocol/IP Control Protocol (PPP/IPCP). However, both DHCP and PPP/IPCP provide host configuration based on the access network. In Mobile IPv4, the registration process boots up a Mobile Node at an access network, also known as a foreign network. The information to configure the

host needs to be based on the home network. This document describes the Cisco vendor-specific extensions to Mobile IPv4 to provide the base host configuration in Registration Request and Reply messages.

## Table of Contents

1. Introduction .....	2
2. Host Configuration Extensions Summary .....	3
3. Host Configuration Extensions .....	4
3.1. Host Configuration Request Extension .....	5
3.2. Home Network Length Prefix Extension .....	5
3.3. DNS Server Extension .....	6
3.4. DHCP Server Extension .....	6
3.5. DHCP Client ID Extension .....	7
3.6. Default Gateway Extension .....	7
3.7. DNS Suffix Extension .....	8
3.8. Configuration URL Extension .....	8
4. Security Considerations .....	9
5. Acknowledgements .....	9
6. Informative References .....	9

## 1. Introduction

An IPv4 device requires some basic configuration to communicate with other nodes. Typically, it has an IP address for an interface and DNS server's IP address to resolve the peer's hostname to an IP address. DHCP [RFC2131] and PPP/PCP [RFC1332] provide host configuration information on the access network interface, but this is inadequate in a Mobile IPv4 environment. In Mobile IPv4 [RFC3344], a Mobile Node has a virtual network interface on the home network, anchored by the Home Agent. The IP address, home subnet prefix, default gateway, and home network's DNS servers are essential in the boot up of a network interface. In some cases, these are the only pieces of information needed by the Mobile Node.

The Mobile IPv4 registration process provides the mechanism for a Mobile Node to boot up on a foreign network. Upon the successful registration, the Mobile Node can communicate with the Correspondent Node. The need to provide an efficient method to obtain the host configuration exists. If the Mobile Node is a DHCP client, it can obtain configuration parameters from the DHCP server in the home network after the initial registration.

This document introduces the Cisco vendor-specific extensions (VSEs) [RFC3115] to provide the means for a Mobile Node to download some fundamental configuration associated with the home network via the

Home Agent. These extensions provide information for home subnet prefix, DNS server, DHCP server, DHCP client identifier, default gateway, DNS suffix, and configuration URL.

## 2. Host Configuration Extensions Summary

The following Cisco vendor-specific extensions provide the host configuration for a Mobile Node. The "Host Configuration Request" extension is allowed only in the Registration Request. The rest of the extensions are appended in the Registration Reply.

- o Host Configuration Request
  - \* Request for host configuration information from the Mobile Node to the Home Agent.
- o Home Network Prefix Length
  - \* The length of the subnet prefix on the home network.
- o Default Gateway
  - \* The default gateway's IP address on the home network.
- o DNS Server
  - \* The DNS server's IP address in the home network.
- o DNS Suffix
  - \* The DNS suffix for hostname resolution in the home network.
- o DHCP Client ID
  - \* The DHCP Client ID used to obtain the IP address. When the Mobile Node returns home and is responsible for managing its own address, this information maps to the client identifier option as defined in section 9.14 of [RFC2132] and referenced in [RFC2131].
- o DHCP Server
  - \* The DHCP server's IP address in the home network.
- o Configuration URL
  - \* The URL for the Mobile Node to download configuration parameters from a server.

When the Mobile Node needs to obtain its host configuration, the Host Configuration Request VSE is appended to the Registration Request. This VSE indicates to the Home Agent that either all or selected host configuration VSEs need to be appended to the Registration Reply. If the Home Agent retrieved the information from a DHCP server (in Proxy DHCP mode), then the DHCP Client ID and DHCP Server extensions are appended in the Registration Reply. These DHCP-related extensions are populated with values that had been used in the DHCP messages exchanged between the Home Agent and the DHCP server.

The VSEs are authenticated as part of the registration message using any of the authentication mechanism defined for Mobile IP ([RFC3344], [RFC3012]).

This message MAY contain extensions defined in Mobile IP, including vendor-specific extensions [RFC3115].

### 3. Host Configuration Extensions

Cisco's host configuration extensions to Mobile IPv4 are based on the vendor-specific extensions defined in [RFC3115]. The format of the VSE TLV (Type-Length-Value) is as follows:

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-----+-----+-----+-----+-----+-----+-----+-----+
|      Type      |      Length      |      Reserved      |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                     Vendor/Org-ID         |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      Vendor-NVSE-Type      |      Vendor-NVSE-Value ...  |
+-----+-----+-----+-----+-----+-----+-----+-----+

```

Type: 134

Length:

Indicates the length (in bytes) of the data field within this extension, excluding the Type and Length fields.

Reserved:

Reserved for future use. To be set to 0 while sending, ignored on reception.

Vendor/Org-ID:

9 (Cisco Systems)

Vendor-NVSE-Type:

14 (Host Configuration)

Vendor-NVSE-Value:

Format is shown below for each subtype. The Sub-Type field is an integer from 0 to 255.

### 3.1. Host Configuration Request Extension

This format of the Host Configuration Request extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Sub-Type               |               Selector               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Sub-Type:

0

Selector:

0 indicates all host configuration available to the Home Agent (HA) is requested by the Mobile Node.

### 3.2. Home Network Length Prefix Extension

This format of the Home Network Prefix Length extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Sub-Type               |               Prefix Length               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Sub-Type:

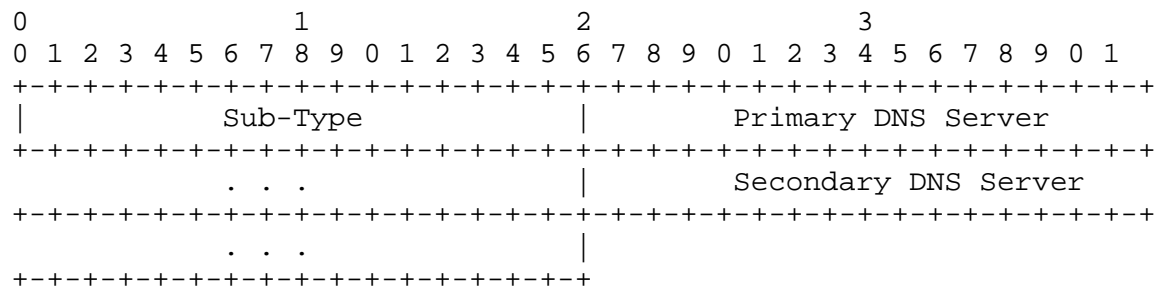
1

Prefix Length:

The number of bits in the home subnet prefix.

### 3.3. DNS Server Extension

This format of the DNS Server extension is shown below.



Sub-Type :

2

Primary DNS Server:

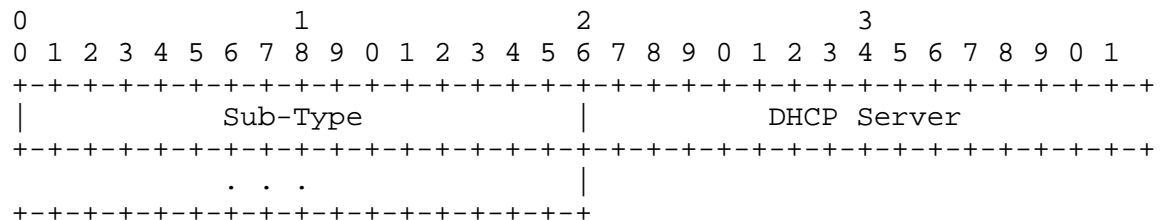
The IP address of the primary DNS server.

Secondary DNS Server:

The IP address of the secondary DNS server.

### 3.4. DHCP Server Extension

This format of the DHCP Server extension is shown below.



Sub-Type:

3

DHCP Server:

The IP address of the DHCP server.

### 3.5. DHCP Client ID Extension

This format of the DHCP Client ID extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               |                               |
|                               |                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Sub-Type:

4

Client ID:

DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The size of field is between 2 and 255 octets.

### 3.6. Default Gateway Extension

This format of the Default Gateway extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               |                               |
|                               |                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Sub-Type:

5

Default Gateway:

The IP address of the default gateway for the Mobile Node on the home network.

### 3.7. DNS Suffix Extension

This format of the DNS Suffix extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           Sub-Type           |           DNS Suffix . . .
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Sub-Type:

6

DNS Suffix:

The DNS suffix to be appended to the name of Mobile Node when completing its fully qualified domain name (FQDN). The size of field is between 1 and 246 octets.

### 3.8. Configuration URL Extension

This format of the Configuration URL extension is shown below.

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           Sub-Type           |           URL String . . .
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Sub-Type:

7

URL String:

The Mobile Node can retrieve configuration parameters via the URL. The URL is at most 246 bytes in length.



#### 4. Security Considerations

The host configuration extensions follow the same rules for Mobile IP extensions in registration messages. See the Security Considerations section in RFC 3344.

The Configuration URL extension may trigger the Mobile Node to download the configuration parameters from a server. The protection of the data transfer is outside the scope of this document. Possible options include encryption of data before transfer or using HTTPS.

#### 5. Acknowledgements

The authors would like to acknowledge Jayshree Bharatia, Kuntal Chowdhury, Avi Lior, and Lila Madour for their contributions to the work in progress titled "Mobile IPv4 Extension for Configuration Options Exchange".

#### 6. Informative References

- [RFC1332] McGregor, G., "The PPP Internet Protocol Control Protocol (IPCP)", RFC 1332, May 1992.
- [RFC2131] Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.
- [RFC2132] Alexander, S. and R. Droms, "DHCP Options and BOOTP Vendor Extensions", RFC 2132, March 1997.
- [RFC3012] Perkins, C. and P. Calhoun, "Mobile IPv4 Challenge/Response Extensions", RFC 3012, November 2000.
- [RFC3115] Dommety, G. and K. Leung, "Mobile IP Vendor/Organization-Specific Extensions", RFC 3115, April 2001.
- [RFC3344] Perkins, C., "IP Mobility Support for IPv4", RFC 3344, August 2002.

## Authors' Addresses

Kent Leung  
Cisco Systems  
170 W. Tasman Drive  
San Jose, CA 95134  
US

Phone: +1 408-526-5030  
EMail: kleung@cisco.com

Alpesh Patel  
Cisco Systems  
170 W. Tasman Drive  
San Jose, CA 95134  
US

Phone: +1 408-853-9580  
EMail: alpesh@cisco.com

George Tsirtsis  
Flarion Technologies  
Bedminster One  
135 Route 202/206 South  
Bedminster, NJ 07921  
US

Phone: +1 908-947-7059  
EMail: g.tsirtsis@flarion.com

Espen Klovning  
Birdstep Technology ASA  
Bryggegate 7  
Oslo, 0250  
Norway

Phone: +47 95 20 26 29  
EMail: espen@birdstep.com

## Full Copyright Statement

Copyright (C) The Internet Society (2005).

This document is subject to the rights, licenses and restrictions contained in BCP 78 and at [www.rfc-editor.org/copyright.html](http://www.rfc-editor.org/copyright.html), and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at [ietf-ipr@ietf.org](mailto:ietf-ipr@ietf.org).

## Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

