

Mobile IP

Intoduciton

- Mobile IP is an Internet standards-track protocol that enhances the existing IP to accommodate mobility.
- Mobile IP in wireless networks is intended to be a direct extension of the existing fixed / wireline networks with uniform end-to-end QoS guarantees.

- The Internet of today lacks mechanisms for the support of users travelling through the world.
- IP is the common base for thousands of applications and runs over dozens of different networks. This is the reason for supporting **mobility at the layer IP.**

Need for Mobile IP

- It has been foreseen that **mobile computing devices** will become more pervasive, more useful, and more powerful in the future.
- The power and usefulness will come from being able to **extend and integrate** the functionality of all types of communication such as Web browsing, e-mail, phone calls, information retrieval, and perhaps even video transmission.

- For Mobile IP computing to become as pervasive as stationary IP networks of the world, an ubiquitous protocol for the integration of voice, video, and data must be developed.
- The most widely researched and developed protocol is Mobile IP.

Advantages of using Mobile IP

- It allows **fast, continuous low-cost access** to corporate networks in remote areas where there is no public telephone system or cellular coverage.
- It supports a **wide range of applications** from Internet access and e-mail to e-commerce.
- Users can be **permanently connected** to their Internet provider and **charged only** for the data packets that are sent and received.

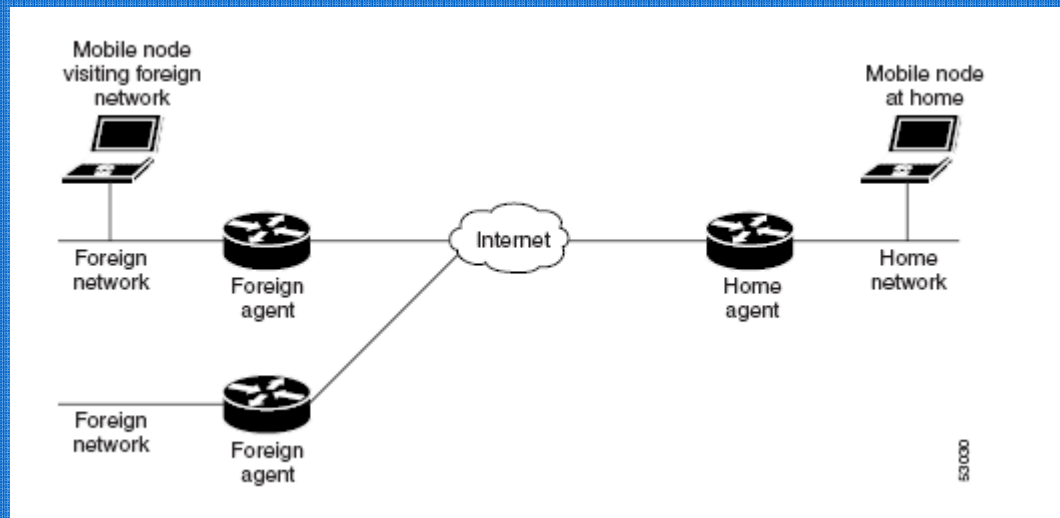
- Lower equipment and utilization costs for those requiring reliable high-speed data connections in remote locations worldwide.
- A user can take a palmtop or laptop computer anywhere without losing the connection to the home network.
- Mobile IP finds local IP routers and connects automatically. It is phone-jack and wire-free.

- Other than mobile nodes/routers, the remaining routers and hosts will still use current IP. **Mobile IP leaves transport and higher protocols unaffected.**
- **Authentication** is performed to ensure that rights are being protected.
- Mobile IP can **move from one type of medium to another without losing connectivity.** It is unique in its ability to accommodate heterogeneous mobility in addition to homogenous mobility.

Disadvantage of Mobile IP

- There is a routing inefficiency problem caused by the “**triangle routing**” formed by the home agent, correspondent host, and the foreign agent.
- **Security risks** are the most important problem facing Mobile IP. Besides the traditional security risks with IP, one has to worry about **faked care-of addresses**.
- Another issue related to the security is how to make Mobile IP **coexist with the security features** coming in use within the Internet.

Mobile IP Network



Characteristics of Mobile IP (Baseline Requirements)

- **Compatibility:** *A new standard cannot require changes for applications or network protocols already in use.*
- **Transparency:** *Mobility should remain “invisible” for many higher layer protocols and applications.*
- **Scalability and efficiency:** *Introducing a new mechanism into the Internet must not degrade the efficiency of the network.*
- **Security:** *All messages used to transmit information to another node about the location of a mobile node must be authenticated to protect against remote redirection attacks.*

The Mobile IP in Wireless Networks

- new proposed standard of the IETF designed to support mobile users .
- new Internet standard for the Web and private networks.
- currently two standards
 - one to support the **current IPv4**
 - one for the **upcoming IPv6**.
- One of the big requirements on the new standard is that it should support both ordinary and wireless network

- The **big issue** is to solve the overlapping between different networks—a user should be able to move between different networks without packet losses.
- The **solution proposed by a working group** within the IETF suggests that the mobile node should use two different IP addresses:
 - a fixed home address
 - a care-of address(COA),
that changes at each point of attachment.
- The solution requires two additional components
 - home agent (HA)*
 - foreign agent (FA).*

IP Address

- An **Internet Protocol address (IP address)** is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication.
- It serves two principal functions:
 - host or network interface identification
 - location addressing.
 - A name indicates what we seek.*
 - An address indicates where it is.*
 - A route indicates how to get there.*
- **Internet Protocol Version 4 (IPv4)** - 32 –bits for addressing still in use.
- a new addressing system : **Internet Protocol Version 46 (IPv6)** , using 128 bits for the address being deployed world-wide.

Internet Protocol Version 4

- 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255.
- 172 . 16. 254 .1 (dotted decimal notation)

172 . 16 . 254 . 1

10101100 . 00010000.11111110. 00000001

1 bytes = 8 bits

4 bytes = 32 bits

Internet Protocol Version 6

- 128 -bit numeric address
- **2001 : 0DB8 : AC10 : FE01 : 0000 : 0000 : 0000 : 0000**
(in hexadecimal)



Zeros can be omitted

The protocol works as follows :

- *Mobile agents (MAs) advertise their presence by sending agent advertisement messages.*
- A mobile host may solicit MAs by sending agent solicitation messages.
- A mobile host uses the MA advertisements to determine if it is on the home or the foreign network.
- When the host is on the home network, it acts independently of the HA.

- When a mobile host returns from a foreign network, it must deregister with the HA through Registration Request and Registration Reply messages.
- When a mobile host finds it has moved to a new, foreign network, it obtains a COA from the FA
- When a mobile host on the foreign network obtains its COA, it registers the new care-of address with the HA using a Registration Request and Registration Reply.

- Datagrams sent to the home network are received by the HA. They are encapsulated in a new datagram that contains the care-of address and are sent to the FA or to the mobile host if it is acting without the aid of the FA.
- Datagrams sent by the mobile host on the foreign network need not be returned to the HA, but could be sent directly to the destination.

This procedure can be described by the three major components of Mobile IP:

- 1. Agent discovery;**
- 2. Registration;**
- 3. Tunneling.**

Requirements of Mobile IP

- A mobile node must be able to communicate with other nodes after changing its link-layer point of attachment to the Internet, yet without changing its IP address.
- Application programs must be able to operate continuously over a single session while the network attachment point of the mobile host changes.
- A mobile node must be able to communicate with other nodes that do not implement these mobility functions.
- All messages used to update another node with the location of a mobile node must be authenticated in order to protect against redirection attacks.