

Mobile IP

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Lesson Outline

- Mobile IP (version 4)
 - Terminology
 - Agent Discovery
 - Registration
 - Routing and Tunneling
 - Home Network Configurations
 - Proxy and Gratuitous ARP
- Mobile IP version 6
 - slides by Charles Perkins (May 31, 2001)

Charles Perkins: IEEE Comm. Mag 35, 5 (May 1997)

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Basic Problem in IPv4

- IPv4 address identifies a node
- IPv4 address is used to find a route to the node
- name and address are the same
- convenient (but change of address!)
- DHCP solves some problems (but DNS!)

Terminology - 1

- Mobile node
- Home agent
 - a router on a mobile node's home network
- Foreign agent
 - a router on a mobile node's visited network
- Agent advertisement
 - a message send by FA
- Care-of-address
 - termination point of a tunnel towards MN
 - foreign agent care-of-address
 - collocated care-of-address (IP address assigned to MN in a visited network)
- Correspondent node

Terminology - 2

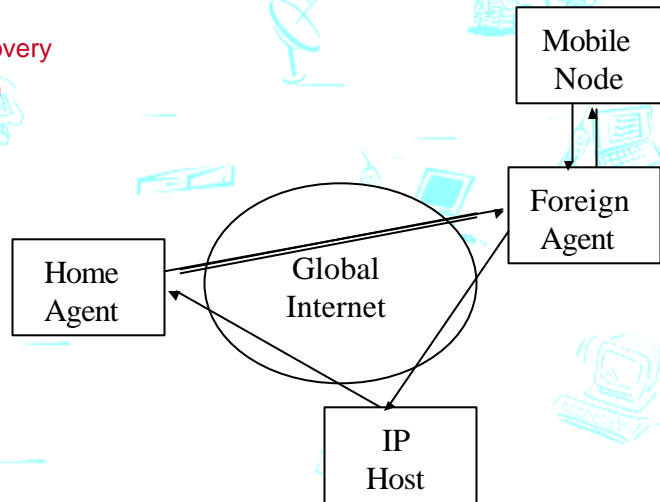
- Foreign network
- Home address
- Home network
- Link
- Link-layer address
- Mobility agent
 - home or foreign agent
- Mobility binding
- Mobility security association
 - collection of security contexts between a pair of nodes
 - authentication algorithm and mode
 - secret
 - style of replay protection in use

Terminology - 3

- Node
- Nonce
- Security parameters index (SPI)
 - identifies security context among those available in mobility security association
- Tunnel
- Virtual Network
 - a network with no physical instantiation beyond its router
- Visited network
- Visitor list
 - list of MNs visiting a foreign agent

Protocol Overview

- Agent Discovery
- Registration
- Tunneling



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Mobile Agent Discovery

- ICMP Router Discovery with mobility agent extension:
 - flags: special features available
 - extension type
 - sequence number
 - lifetime
 - care-of-address
 - Home agent does not advertise care-of-address

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Flags

- Registration required
- FA busy
- Agent is HA
- Agent is FA
- Minimal encapsulation (RFC 2004)
- GRE encapsulation (RFC 1701)
- Van Jacobson header compression (RFC 1144)

Registration Message

- Requests and replies to UDP port 434
- Structure
 - IP header fields
 - UDP header
 - Mobile IP message header
 - Extensions

Registration Request

- Type, flags, lifetime
- Home address
- Home agent
- Care-of-address
- Identification (reply protection)
- Extensions (e.g. mobile-home authentication extension)

Registration Reply

- Lifetime
- Registration status
 - success or failure with reason
- Dynamic Home Agent Discovery
 - broadcast request
 - home agents rejects it (code 136)
 - MN detects IP addresses of HAs

Security in Registration

- Registration messages are prone to attacks
- Nonce is inserted to identification
- Resynchronization needed
- Authentication extensions:
 - mobile-home (in all registration requests and replies)
 - mobile-foreign
 - foreign-home

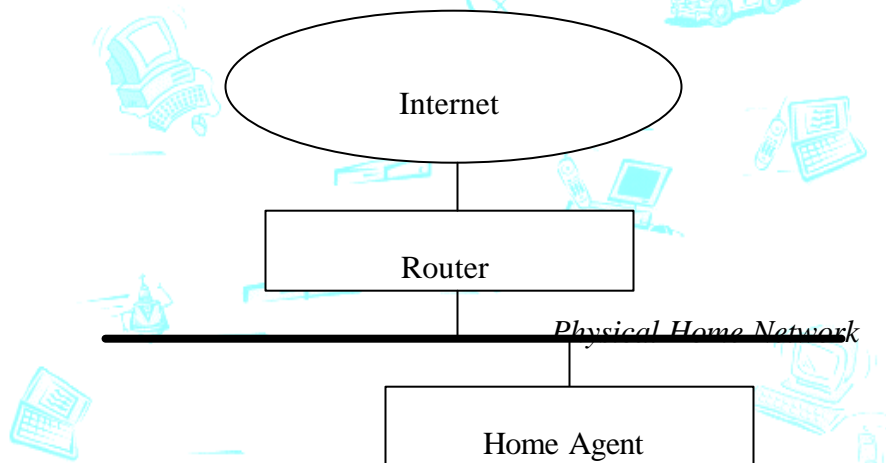
Authentication Extension

- Type
- Length
- SPI
- Authenticator
- Default authentication algorithm is keyed-MD5/prefix+suffix
 - 128-bit diggest

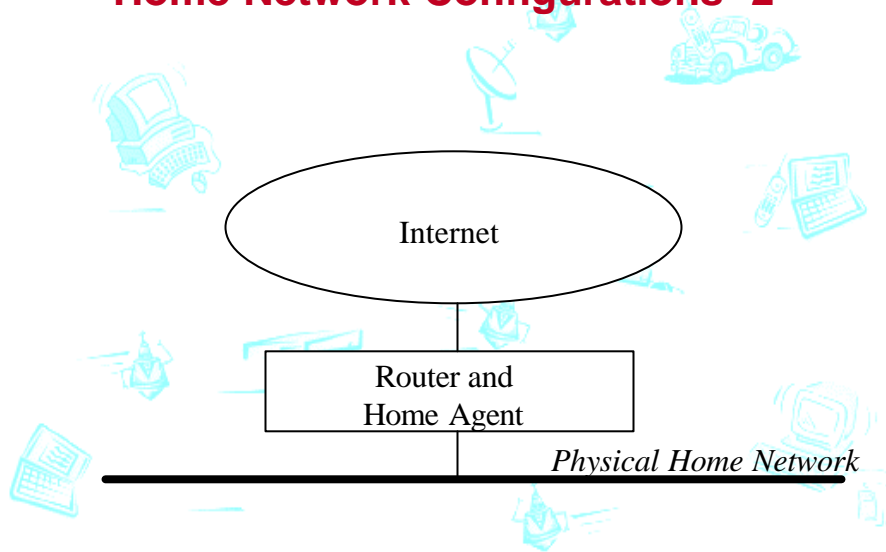
Routing and Tunneling

- Encapsulation
 - minimal, IP-within-IP, ...
- Soft tunnel state
 - Information in ICMP error messages insufficient
- Home Network Configurations
- Proxy and Gratuitous ARP

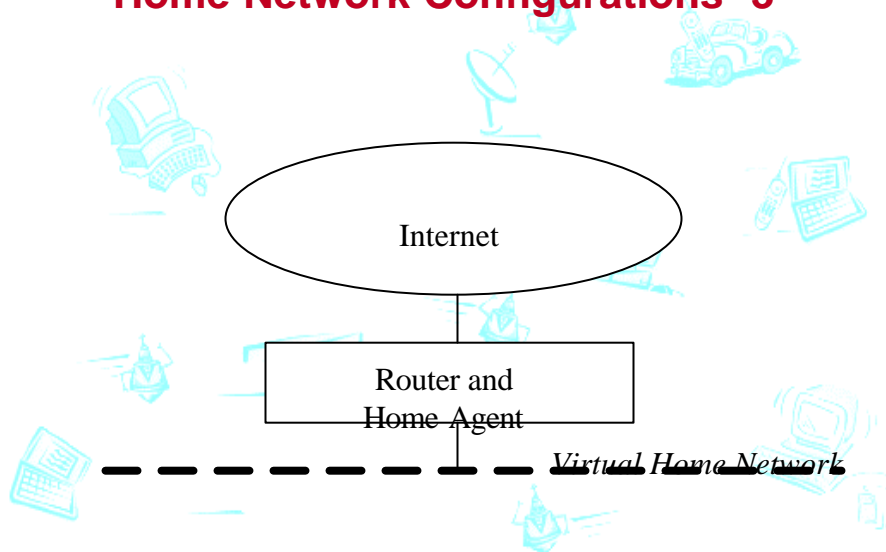
Home Network Configurations - 1



Home Network Configurations -2



Home Network Configurations -3



Proxy and Gratuitous ARP

- In the case of physical home network home agent has to perform proxy ARP to the MN
- When MN moves from home ARP cache entry become stale
- Therefore, HA needs to broadcast gratuitous ARP when ever MN leaves or arrives home network
- MN should never broadcast an ARP request or reply in any visited network