Using DNS to Support Host Mobility

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Objectives

• Supporting host mobility
  • getting packets to and from hosts as they move

• Properties desired:
  • scalability
  • fault-tolerance
  • transparency

• Questions:
  • can DNS be extended to solve this problem?
  • can appropriate end-host behavior help?
Issues Related to Mobile IP

- HA needs to be physically located on the home subnet
  - active participant in routing
  - single point of failure

- HA is the single registration authority
  - latency of communication
  - scalability
  - difficulty of separating local and global protocols
  - (hierarchical mobility agents may help)

- Route optimization:
  - CH maintains a binding cache of MH addresses
  - CHs do not share their binding caches
DNS-based Solution

- Our approach:
  - Directory lookup model: enhance DNS to map from MH’s name to current address
  - DNS is hierarchical, replicated and distributed
    \[ \Rightarrow \text{scalable and fault-tolerant} \]

- Basic issues:
  - Locating the MH before initiating a connection
  - Discovering that MH’s address has changed between connections (cached address is stale)
  - Handling address changes during a connection
Locating Mobile Hosts

- MH behavior:
  - determines (a subset of) name servers for local domain
  - updates resource records (RRs) dynamically
  - informs authoritative name servers for home domain of its current location (only the first time it registers in a foreign domain)

- Home domain name server:
  - adds records to point to servers in MH’s local domain

- Name server in CH’s domain:
  - does iterative lookup via home domain name servers
  - caches addresses of name servers and MH
Scenario

Internet

Home domain

Foreign domain

DNS to Support Mobility
Handling Address Change

• With no changes to CH
  • appropriately chosen time-to-live (TTL) values
    - larger for name server address, smaller for MH address
    - modulated by mobility pattern
  • local routing support to avoid disruption in traffic
    - similar to forwarding by foreign agents in Mobile IP with route optimization

• With changes to CH
  • explicit error message sent back by router on old subnet forcing an authoritative DNS lookup
  • timeouts (such as during SYN exchange for a TCP connection) forcing an authoritative DNS lookup
Address Change During Connections

• TCP/IP model uses end-point addresses to identify connections
  • problem when hosts are mobile

• Need to decouple network and transport addressing
  • extend TCP/UDP headers to include transport-layer identifiers separate from IP addresses
  • applications only use transport-layer addresses

• Alternative solution: fixed multicast address for each MH
  • need scalable multicast routing

• Mobile IP solution: encapsulation/decapsulation
Summary

• Dependence on intermediate agents to do routing impacts fault-tolerance

• Our solution: handle mobility by efficient translation from name to current address with some local routing support
  • DNS with dynamic updates
  • security issues to be resolved

• Applicability to other environments
  • DHCP reconfigure operation: address change on-the-fly
  • IP phone: looking up dynamically assigned IP address of callee’s computer

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