Internet connectivity for mobile ad hoc networks

Based on the journal article by Perkins, et. al., published in Wireless Communications and Mobile Computing, 2002, 2:465-482.

The problems 1/2

- site-local address acquisition
- routing prefix acquisition
- default route to the gateway
- globally unique and topologically correct IPv6 address
- soliciting gateway information when needed

The problems 2/2

- is the destination present in the ad hoc network?
- using the globally unique IPv6 address with Mobile IPv6
- modifying ICMPv6 Router Solicitation and Advertisement to work across multihop networks
- extending route discovery mechanisms to gateway discovery for on-demand protocols

Local address configuration

- a node chooses a site-local address candidate
- uses a transient address to verify the uniqueness of the candidate
- modified IPv6 Neighbor Solicitation
- Address Request message (AREQ)
- Address Reply message (AREP)

Comments on local address configuration

- Easy Denial of Service attack: AREP all AREQs
- Solution: CGAs?

Obtaining global addresses

- a global prefix needed
- Internet Gateway Discovery
  - Gateway Request and Reply
  - Gateway Solicitation and Advertisement

Gateway Request and Reply 1/3

- Destination: INTERNET_GATEWAYS multicast address
- Internet-Global Address Resolution flag to RREQ and RREP
  - gateway unicast RREP with global prefix and gateway's IPv6 address

Gateway Request and Reply 2/3

- Destination: global addresss (Internet)
- the destination node could be in the ad hoc network which results to two different replies
- prefer the ”host route”

Gateway Request and Reply 3/3

- AREQ: not explicit gateway request
- gateway unicast RREP with global prefix and gateway's IPv6 address

Gateway Solicitation and Advertisement

- extended IPv6 Router Solicitation: Gateway Solicitation
- extended IPv6 Router Advertisement: Gateway Advertisement
- Manet flag: message can be forwarded to a non-link-local address

Address configuration

- the node now has the global prefix
- global prefix + host number from the manet-local address = global unique IPv6 address

Setting the default route

- protocols that do not maintain next-hop information for the default route
  - two entries to the routing table
  - refresh these routes and rerequest globcl prefix information from the gateway before timeout
- protocols that can maintain just the next-hop default router do not need periodic refreshes.

Internet access methods

- is the destination host
  - in the ad hoc network
  - outside the ad hoc network (in the Internet)
- Mobile IPv6 complicates the decision

Route discovery algorithm

- node sending a packet refers to the routing table
  - if default route, RREQ for host route if shortest route important
  - if host route, send packet toward the destination
  - if no routes, start the gateway acquisition operation, if this fails, drop the packet

Sending data via the Internet Gateway

- if next-hop forwarding is supported, the node sends the packets to the global IPv6 destination address
- if next-hop forwarding is not supported
  - destination: the IPv6 address of the gateway
  - final destination address is put in the routing extension header
  - the gateway mangles the packet

Route examination or determination 1/2

- a packet arrives from the Internet interface of the gateway and no route is found
  - if a table-driven routing protocol is used, send an ICMPv6 Destination Unreachable message to the source
  - if on-demand routing protocol is used, initiate route discovery. if no route is found, send an ICMPv6 Destination Unreachable message to the source

Route examination or determination 2/2

- a packet arrives from the ad hoc network interface of the gateway
- if a route in the ad hoc network is found, the gateway sends a Route Update Request to the source node
- when source node receives the RUR it can initiate a new route discovery operation

What was left out of this presentation

- Mobile IPv6 operation
- AODV6 case study

Conclusion

- good: a general framework, not just for a certain routing protocol.
- bad: no security considerations