

Interconnection of Ad Hoc Networks to fixed IP Networks: The Path Selection Dilemma



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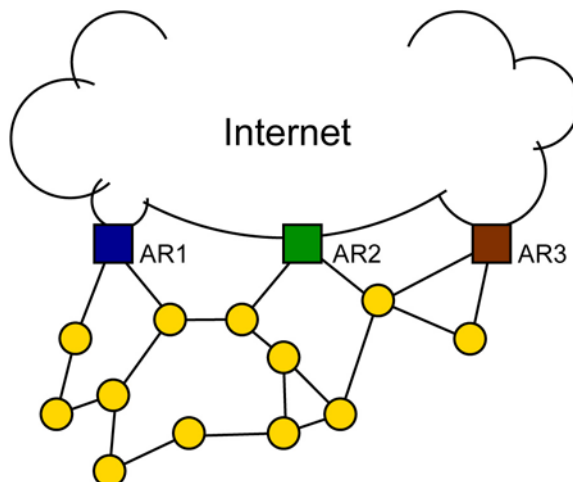
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Department
EE and IT

Talk at the 1st Meeting of the
IRTF Working Group on Ad Hoc Networking Scaling (ANS)
Annapolis, MD. June 1, 2003.

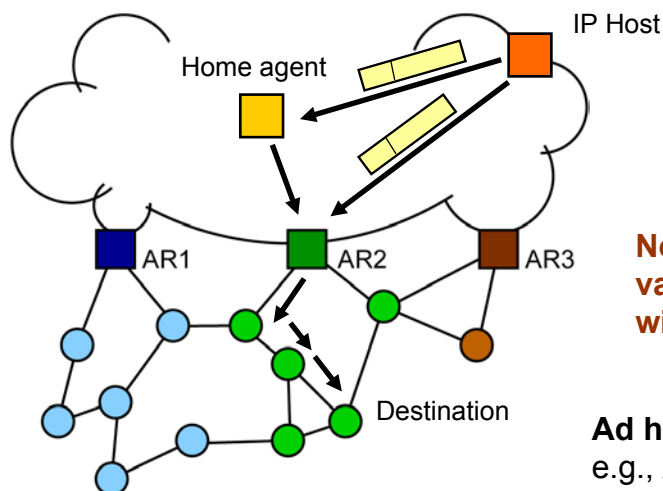
Interconnection of Ad Hoc Networks to the Internet



Publications

- J. Broch, D. A. Maltz, D. B. Johnson: "Supporting Hierarchy and Heterogeneous Interfaces in Multi-Hop Wireless Ad Hoc Networks," *ISPAN*, 1999.
- U. Jönsson, F. Alriksson, T. Larsson, P. Johansson, and G. Q. Maguire: "MIPMANET: Mobile IP for mobile ad hoc networks," in *Proc. ACM MobiHoc*, 2000.
- Y. Sun, E. M. Belding-Royer, C. E. Perkins: "Internet Connectivity for Ad hoc Mobile Networks," *Intern. J. of Wireless Information Networks*, 9(2), April 2002.
- J. Xi and C. Bettstetter: "Wireless Multi-Hop Internet Access: Gateway Discovery, Routing, and Addressing," In *Proc. Intern. Conf. on 3G Wireless and Beyond (3Gwireless'02)*, May 2002.
- G. Andreadis: "Providing Internet Access to Mobile Ad Hoc Networks", *London Communications Symposium*, Sept 2002.
- R. Wakikawa, J. T. Malinen, C. E. Perkins, A. Nilsson, A. J. Tuominen: "Global connectivity for IPv6 Mobile Ad Hoc Networks" (draft-wakikawa-manet-globalv6-02.txt), Nov 2002
- P. Ratanchandani and R. Kravets: "A Hybrid Approach to Internet Connectivity for Mobile Ad Hoc Networks", *IEEE WCNC*, Mar 2003.

Routing: Internet -> ad hoc node

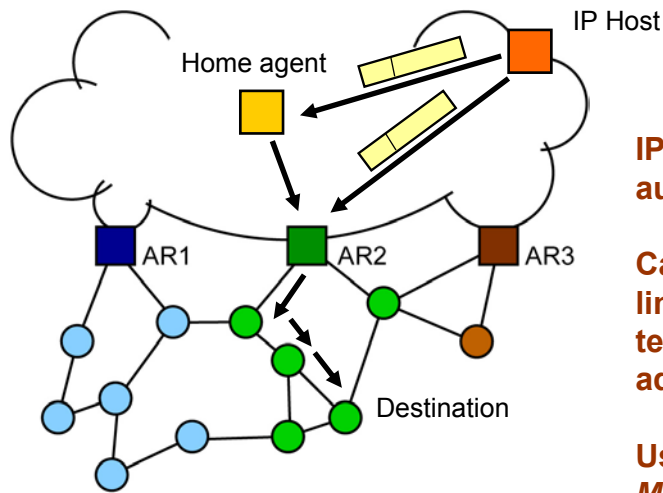


Mobile IP

Node needs globally valid care-of address with prefix of AR

Ad hoc routing protocols
e.g., AODV, DSR

Routing: Internet -> ad hoc node

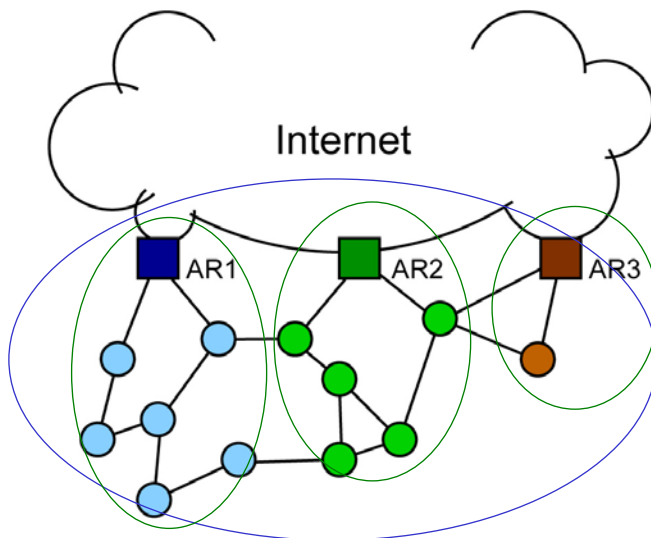


IPv6 stateless address autoconfiguration:

Cannot use reserved link-local prefix as temporary initial address.

Use of reserved MANET-local prefix.

Two Scopes: MANET-local, Logical IP Subnet



MANET Local Scope
Local address
with reserved prefix

Flat routing

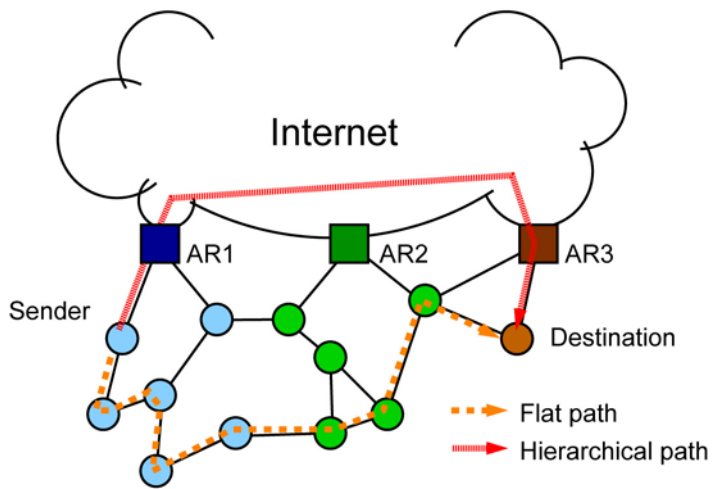
Packets with such DEST
are forwarded by all MNs
within hop limit.

IP Subnet Scope
Global care-of address
with prefix of AR

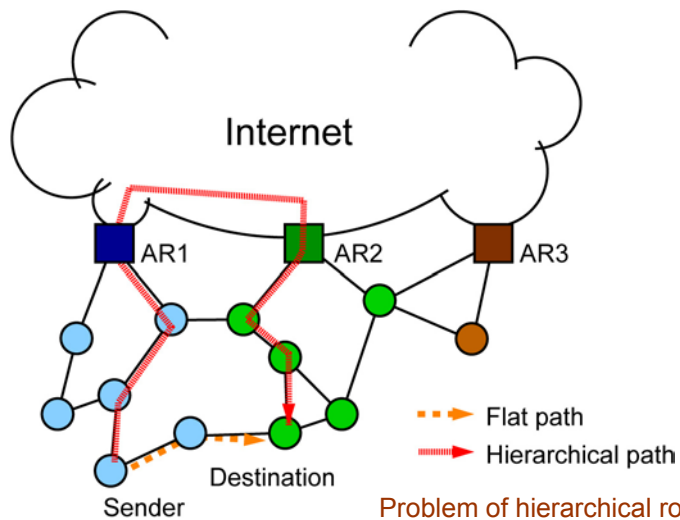
Hierarchical routing

Packets with such DEST
are forwarded to subnet
members only

Routing: Ad Hoc Node -> Ad Hoc Node

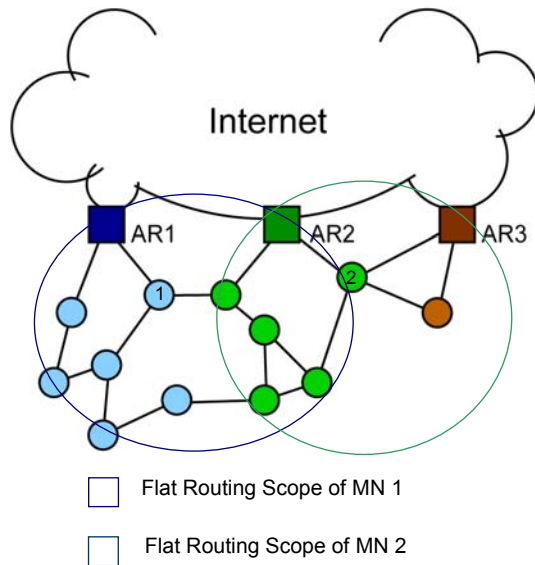


Routing from Ad Hoc Node to Ad Hoc Node



Problem of hierarchical routing: No multihop connectivity between logical IP subnets.

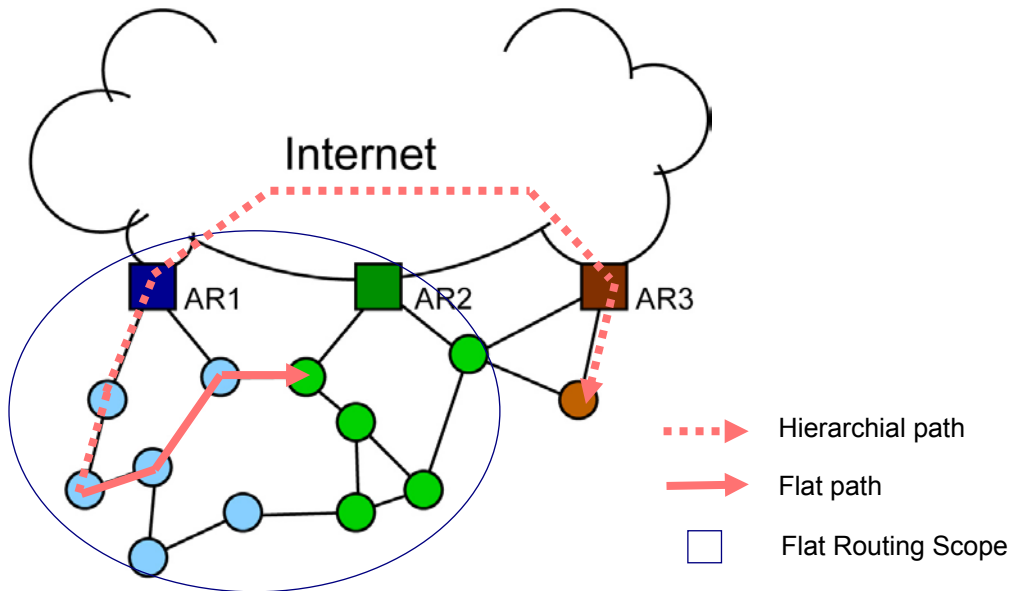
Third Scope: "Flat Routing Scope" for Route Optimization



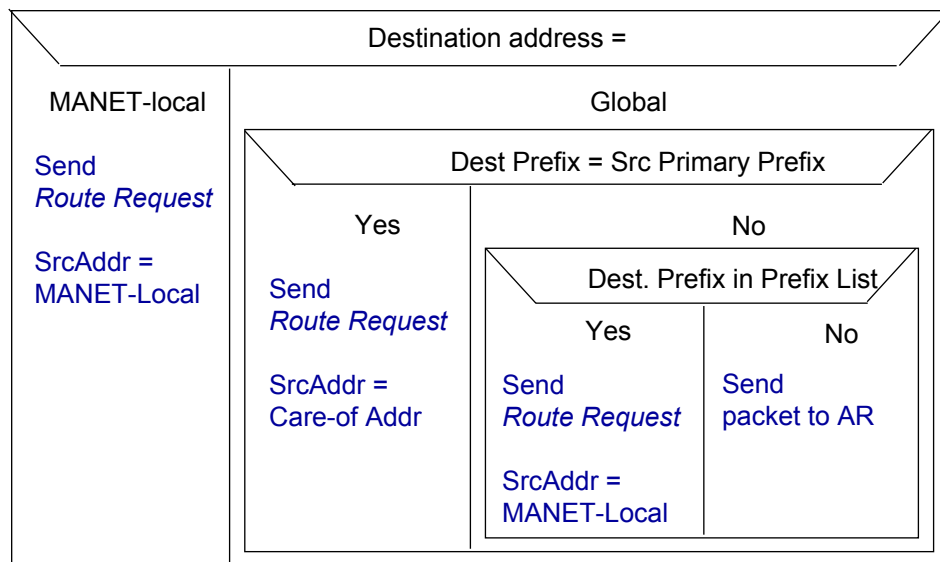
PREFIX CACHE / LIST

- Maintained by each node
- Includes recently learned AR prefixes
- Neighbor Discovery Protocol (RFC 2461)

Route Optimization : Optimization example



Route Optimization : Flow Chart



Interworking of Ad Hoc Networks to fixed IP Networks

- Good advances in solving the interconnection of ad hoc networks to fixed IP networks.
- But still open issues:
 - Path selection
 - Gateway selection
 - ..
- Is it a relevant topic for IRTF ANS ?