



Active source routing for ad-hoc network: seamless integration of wireless environment

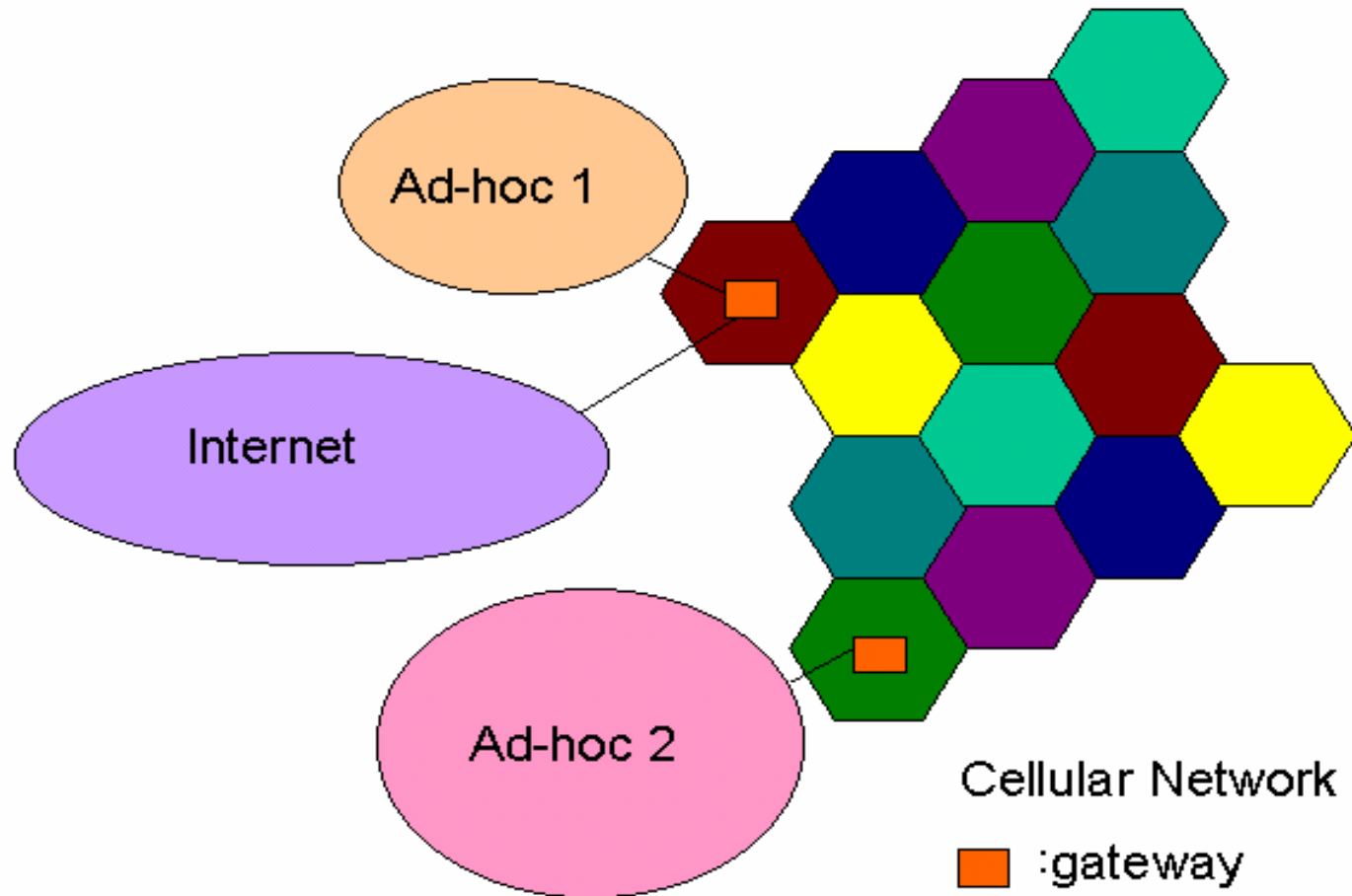
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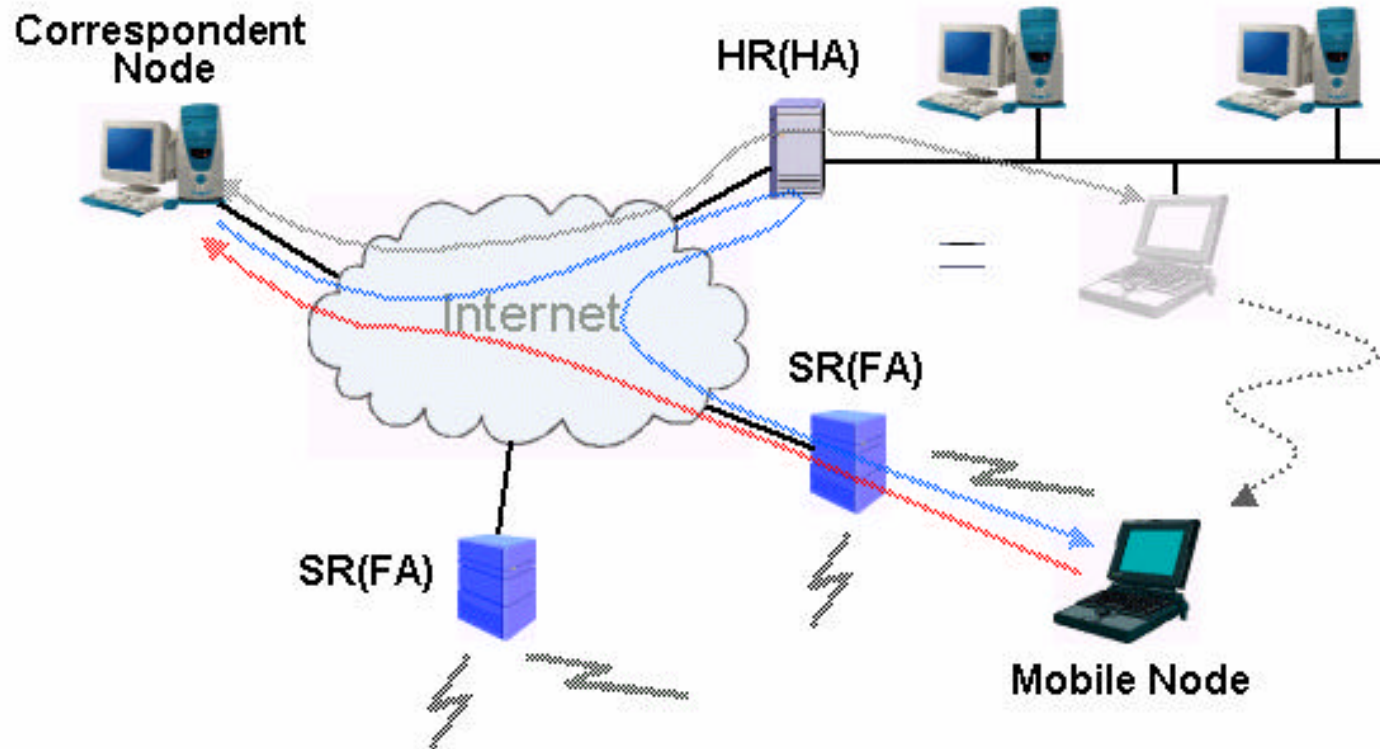
Introduction

- Heterogeneous network environment
- There is no “one size fits all” solution
- Need to offer seamless and ubiquitous service
- Combination of ad-hoc and cellular(mobile) network using gateway

The big picture



Mobile IP in cellular network





Mobile IP

- Mobile IP : “macro” mobility management
- High Control Overhead : Frequent notifications to the HA
- High latency and disruption during handoff
- Micro mobility
 - Mobile IP Regional Tunnel Management
 - Mobile IP based Micro Mobility Management Protocol
 - HAWAII(Handoff Aware Wireless Access Internet Infrastructure)
 - Cellular IP



Wireless ad-hoc network

- A **temporary, self-organized** network formed by a collection of mobile hosts with wireless network interfaces **without** the aid of any established infrastructure or centralized administration.
- Ad-hoc routing protocols
 - table-driven routing protocol(proactive): destination-sequence distance-vector(DSDV) routing, clustered gateway switch routing(CGSR)
 - source initiated on-demand routing protocol(reactive) : ad hoc on-demand distance vector(AODV) routing, dynamic source routing(DSR)



Source routing

- A data transmitting method with path info. in the data packet explicitly
- Route discovery: To find a route to destination
- Route maintenance: Adapt to the changes in network topology. For example, node moving
- Advantage
 - No periodic routing advertisement
 - Saving network bandwidth
 - Battery power saving
 - Simple to implement
 - Adaptive to network topology change



DSR route discovery process

Route discovery Process:

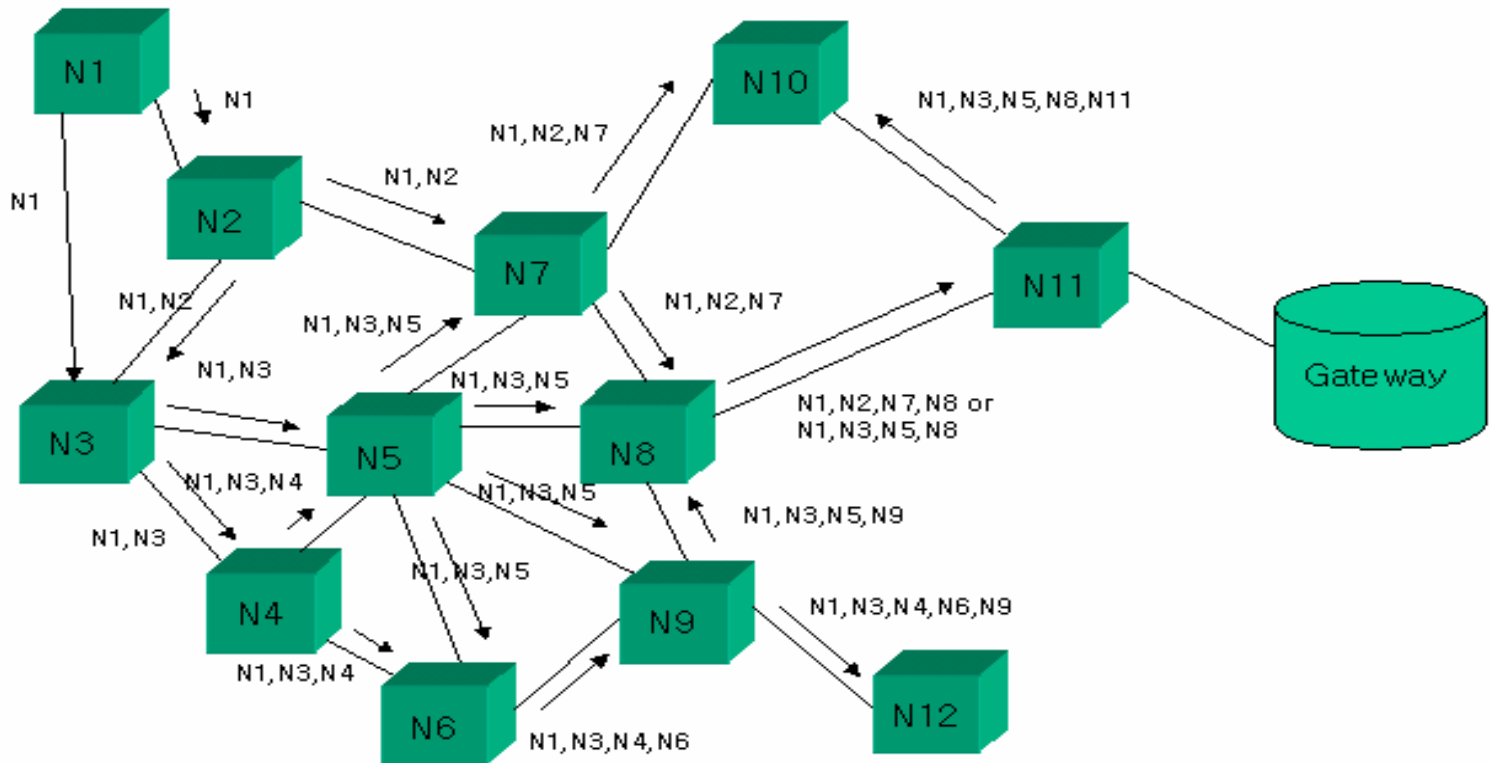
1. If the pair is in the LRSR(List of recently seen request), discard this request
2. If this host is in the route record, discard this request
3. If target = this host, send Route Reply packet
4. Otherwise, add this host to route record and rebroadcast the route request.
5. From the target, reverse the route record, unicast Route Reply to source with route record



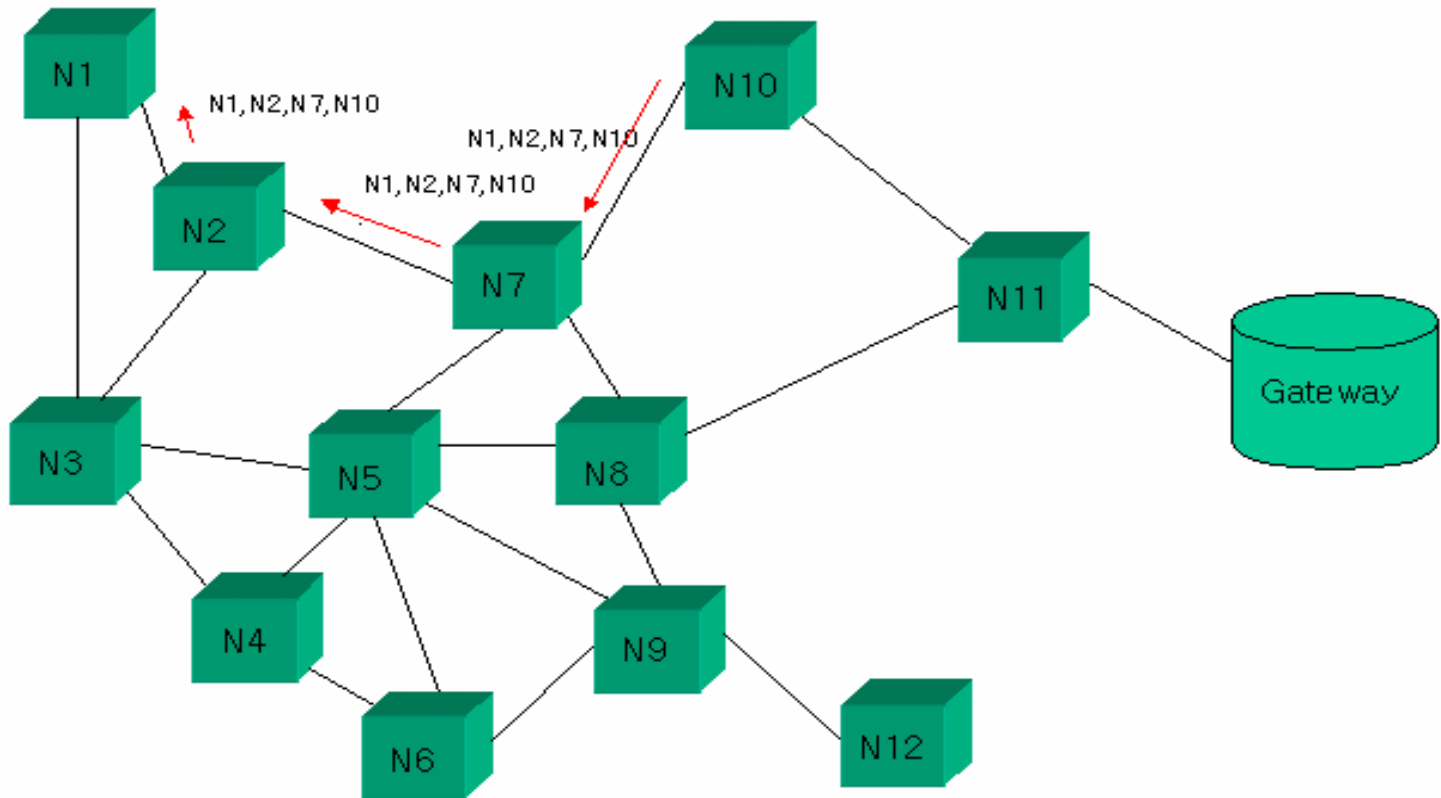
Active Source Routing

- Using DSR-like approach as a initial route discovery
- Soft-state data cache
- Route discovery and maintenance cache
- Active control packet
 - Proactive periodic route maintenance
 - Simple header format: using dynamically assigned Tag instead of IP header
 - Movement degree: notified by regional cache update rate → modification of data packet

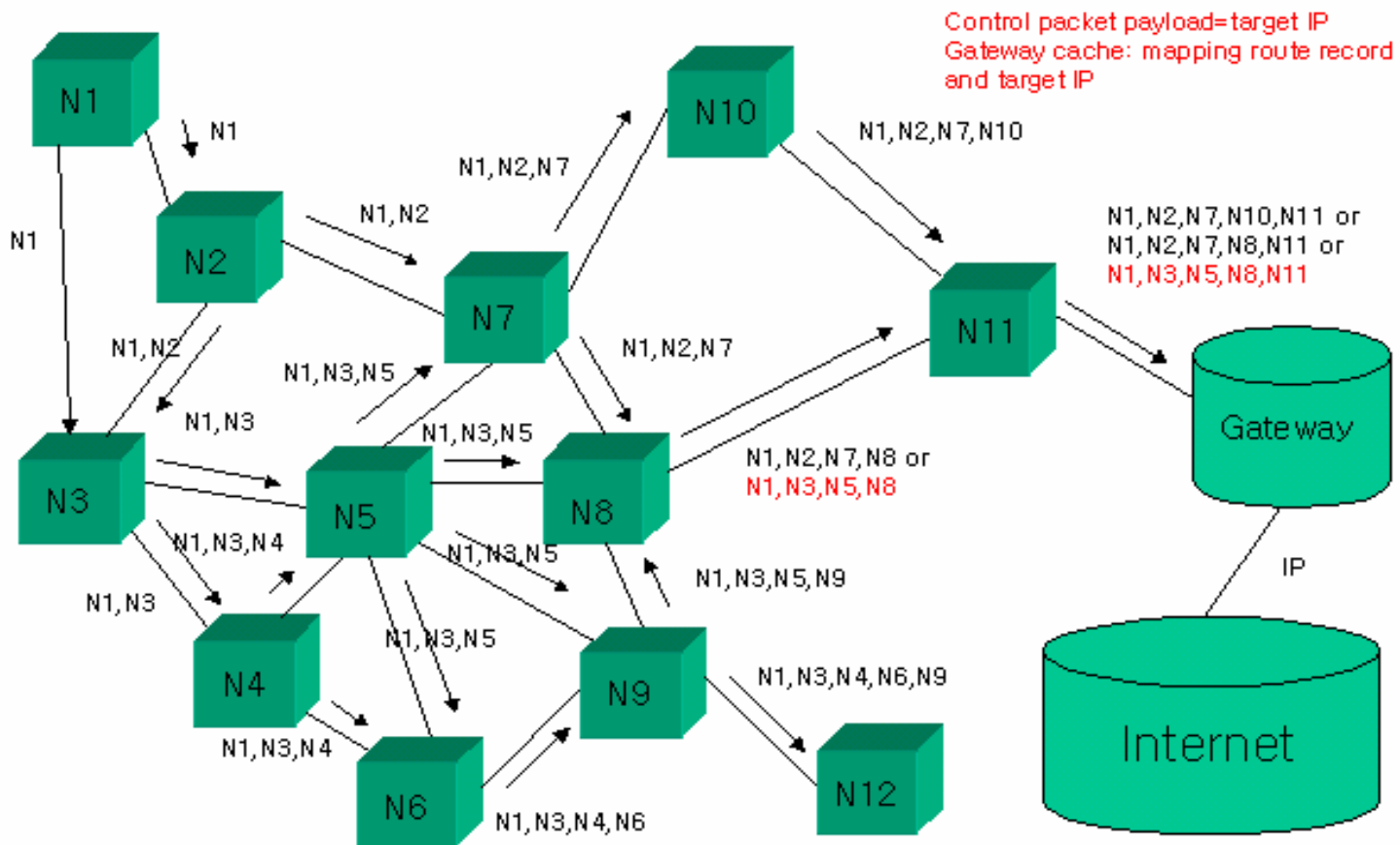
Inner ad-hoc network(1)



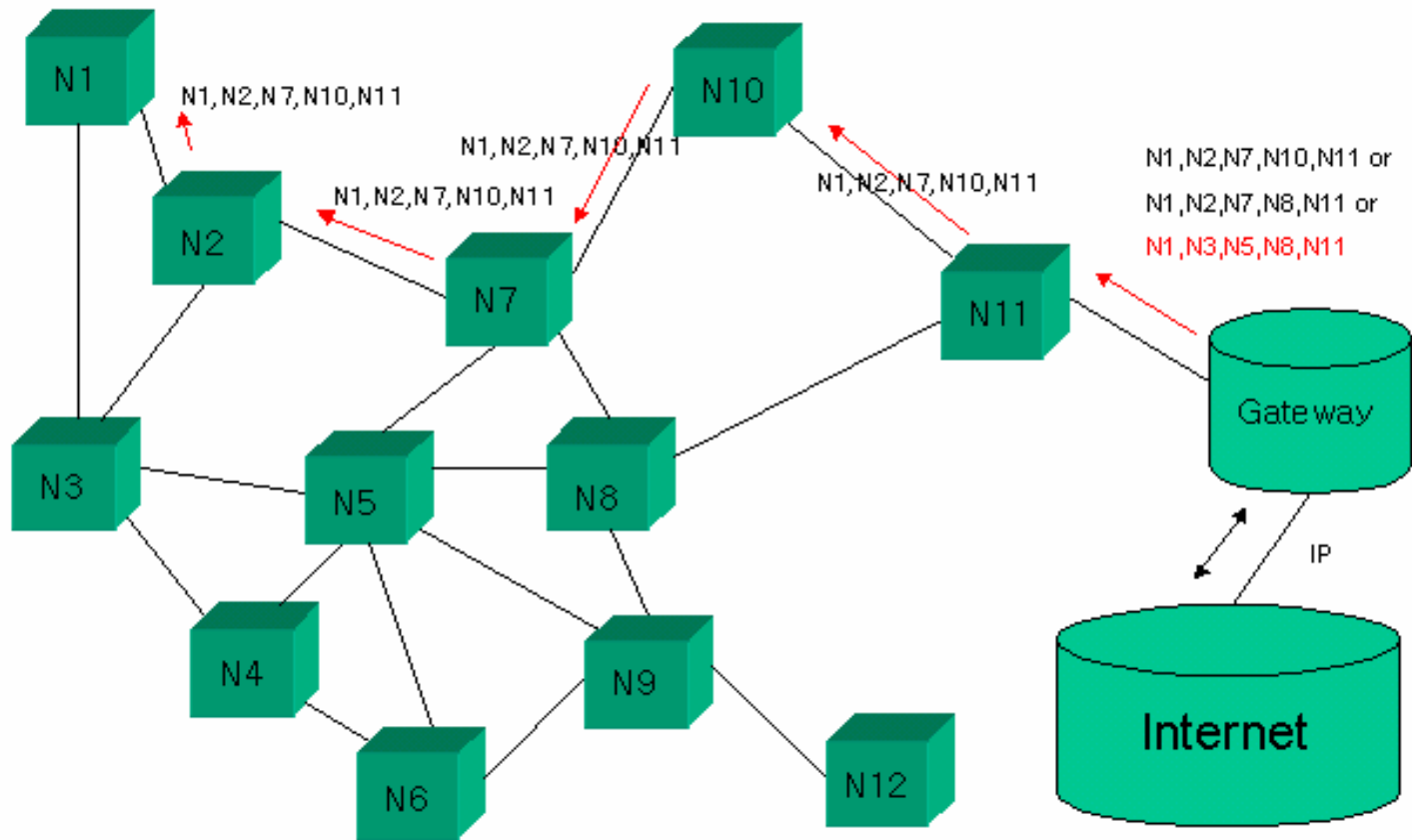
Inner ad-hoc network(2)



Internet access through gateway (1)



Internet access through gateway (2)

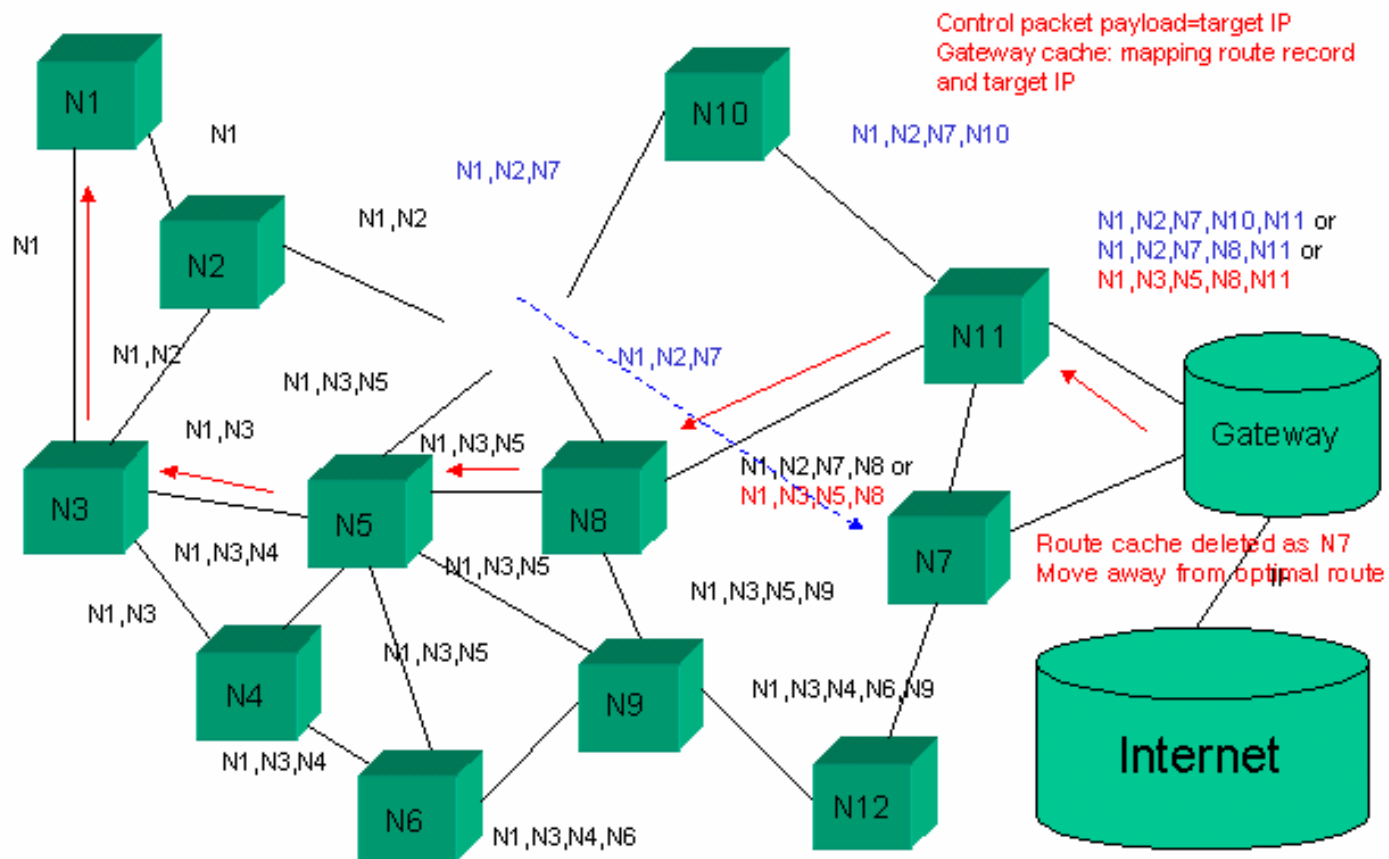




mobility management and route update

- More movement → more packet loss and more control packet
- Data cache can minimize retransmission hops
- Small packet size minimize possibility of packet loss

Loss of mobile node





ASR packet format

- Route_Request,Route_Reply:route discovery
- Access_Request: request Internet access through gateway.
- Route_update:After route is set up, update route
- Movement_warning:prepare for route change or aggravated channel condition. By executing active codes, cache allocation and buffer size can be reconfigured.
- NAK: send retransmission request packet.

Routing Tag	Active Type Header	Sequence#	Payload	Checksum
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Other Issues

- Sensor network: Energy constraint, comparably stable, Different approach
- Partitioning: Unreachable portion of wireless network, network scouting node?
- Security: Data flow traverse through other end user



Conclusion

- seamless and ubiquitous services for future network
- Hand-over between different wireless access technologies
- ASR utilizes active network technology as a adaptive control path controller
- ASR should be refined and need to be simulated for evaluation