

An Examination about Gateway Determination Method considering Route Stability on the Hybrid Ad-hoc Network

Hideki Shimada
Information Technology Center
Postdoctoral Researcher

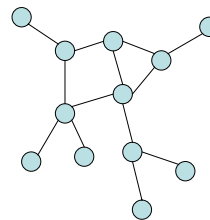
Agenda

- Background
 - ◆ Types of Ad-hoc Network
 - ◆ Motivation
- Objective
- Gateway Selection Method
 - ◆ Route Stability
- Simulation
- Conclusion
- Future Work

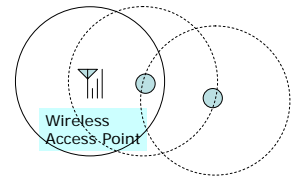
Background

- MANET (Mobile Ad-hoc NETWORK)
 - ◆ Wireless multi-hop network among mobile nodes
 - Node Mobility Support
 - ◆ Autonomously constitution
 - Anywhere, Anytime, Anybody
 - important framework of ubiquitous network
 - ◆ (Basically) No infrastructure
 - Distressed area
 - ITS (Intelligent Transport Systems)
 - Battlefield
 - Sensors

Types of MANET



Standalone
(No Infrastructure)



Hybrid
(Infrastructure Complement)

MANET Routing Protocol

- Standalone
 - ◆ On Demand Type
 - AODV -- RFC3561 [2003/07]
 - DSR -- Internet Draft
 - ◆ Table Driven Type
 - OLSR -- RFC3626 [2003/10]
 - TBRPF -- RFC3684 [2004/02]

- Hybrid
 - ◆ AODV6

Ryuji Wakikawa, Jari T. Malinen, Charles E. Perkins, Anders Nilsson, Antti J. Tuominen, "Global Connectivity for IPv6 Mobile Ad Hoc Networks" (draft-wakikawa-manet-globalv6-03.txt), Internet Draft, Internet Engineering Task Force, Oct. 2003.

Motivation

- Develop daily application on MANET.
 - ◆ Many routing protocols are proposed.
 - The issues of protocols will be finished.
 - Development of applications is important in order to make MANET general.
- ◆ Wireless access points are placed in the public space.
 - These coverage areas are less insufficient than those of the cellular phones.

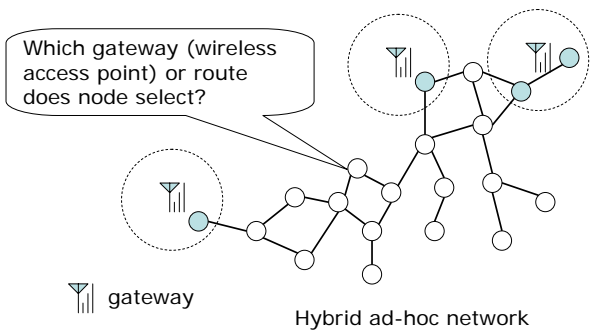


Objective

- Implementation of wireless Peer-to-Peer system using MANET technology.
 - ◆ Wireless multi-hop network is constituted in the environment where the wireless access points exist.
 - ◆ The coverage of the wireless access points and the opportunities for our use are extended.



Overview



Problem

- In many MANET routing protocol, nodes use the routes that reply packets has reached first.
 - ◆ Wireless connection between nodes is unstable.
 - Mobility
 - Characteristic of wireless network device
- ↓
- It is important to determine the more stable route.



Detection of Route Stability

- Criteria of stability
 - ◆ Hop count
 - ◆ Route connection time
 - ◆ Radio wave intensity
 - ◆ Installation location of wireless access point
- [Future work] Write detection rule with these criterions



Simulation

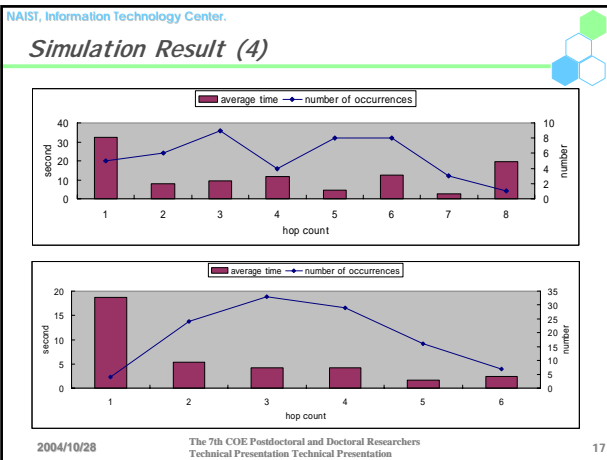
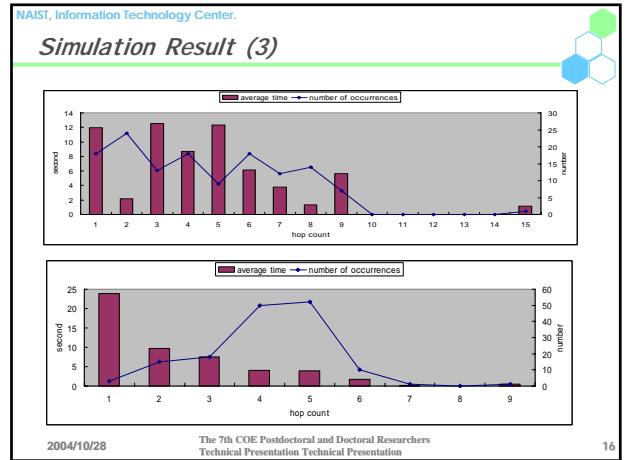
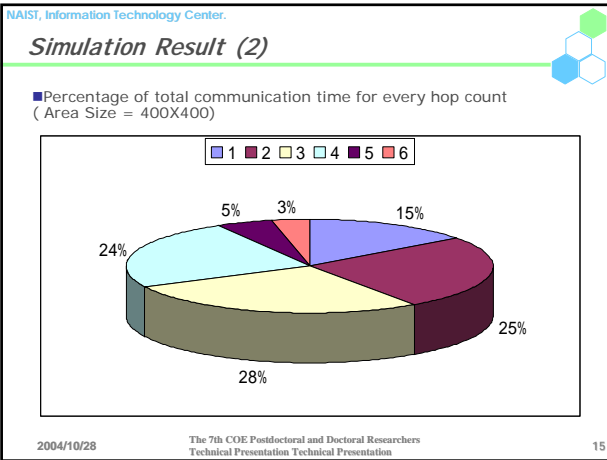
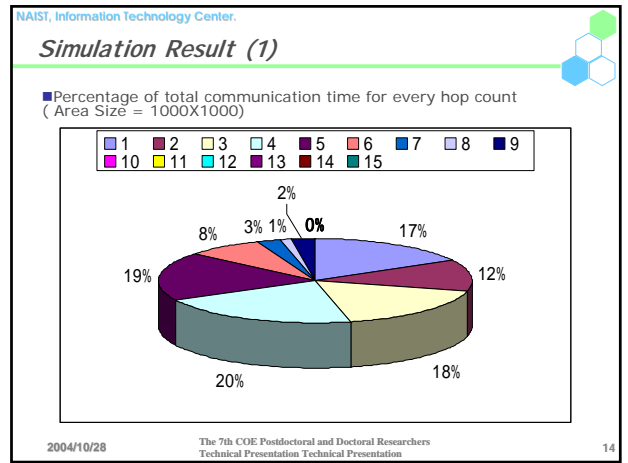
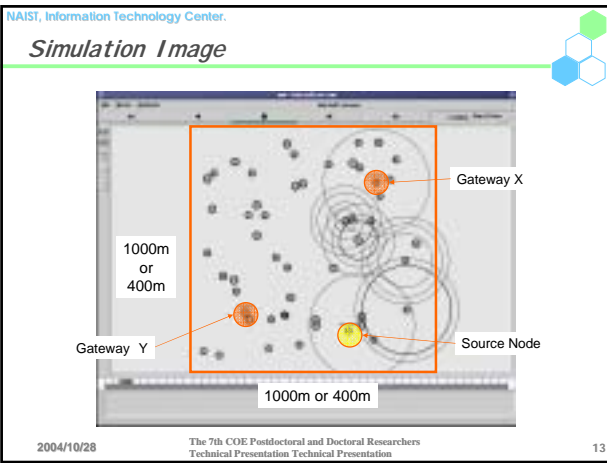
The Number of Node	Area Size	Speed	Transmission Range
50	1000X1000	Within 3m/s	250m
50	1000X1000	Within 15m/s	250m
50	400X400	Within 3m/s	100m
50	400X400	Within 15m/s	100m

- Node density is the same in all conditions.
- In the case that area size and node speed change, simulations check the criterions of stability, hop count and route connection time.



Conditions of Simulation

- Field size → 1000m × 1000m and 400m × 400m
- The number of mobile nodes → 50
- The number of static nodes → 2
- Mobile nodes move by Random Waypoint Model(within 3m/s or 15m/s)
- Simulation time → 100 second
- Routing Protocol → AODV (Ad hoc On-Demand Distance Vector)
- Transfer area of radio wave → 250m or 100m
- Bandwidth of radio wave → 2Mbps
- Propagation model of radio wave → Two Ray Ground model
- Source node sends CBR packet of 500 byte at 4 packets / s
- Antenna characteristic → Omni antenna



NAIST, Information Technology Center.

Simulation Consideration

- Hop count and route connection time, criterions of stability, have compared.
- Hop count
 - ◆ When area size is smaller, hop count become smaller too.
 - ◆ When the speed of node is higher, hop count become smaller.
- Route connection time
 - ◆ When hop count is bigger, connection time becomes shorter.
 - ◆ However, the number of network division is also effected.

2004/10/28 The 7th COE Postdoctoral and Doctoral Researchers Technical Presentation Technical Presentation 18



Conclusion

- Proposal of gateway selection in the hybrid ad-hoc network.
- Consideration about criterions of route stability.
- By simulation, examination about effect of hop count and route connection time.



Future Work

- Implementation of MANET by using MANET routing protocol.
- Examination in the real world by this implementation.