

# The System that provides the Internet Connectivity by using Ad-hoc Network

inet-lab  
postdoctoral researchers  
Hideki Shimada

## Agenda

- Introduction
- Proposed System
  - Overview
  - Configuration of the Ad-hoc Network
- Selection of Access Points
  - Selection Criteria of Access Points
  - Simulations about the Number of Hops
- Conclusions

## Introduction

- The spread of Internet connectivity using the cellular phone and the wireless LAN system
  - The access speed of these devices is being improved.
  - These devices are available in the public spaces.
- Peer-to-Peer (P2P) System
  - The terminals of client have been high performance.
  - P2P system manages information more distributed than client-server model.

Wireless communication + P2P  
Ad-hoc Network

## What is Ad-hoc Network ?

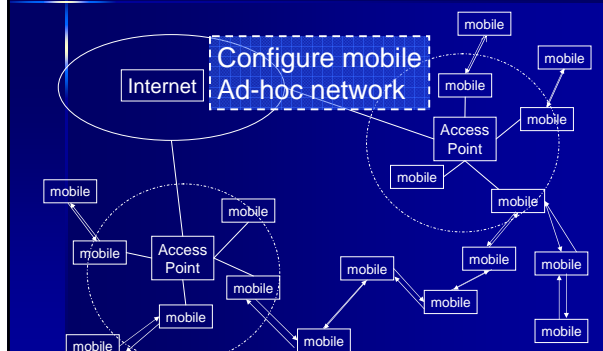
- No infrastructure
- Autonomously Constitution
- Wireless Peer-to-Peer Communication among mobile hosts
- Applications
  - Military affairs
  - Lifeline at the disaster area
  - ITS

## Purpose

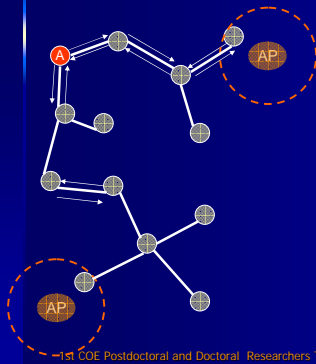
### Propose of wireless Peer-to-Peer system using mobile Ad-hoc network

- Wireless multi-hop network is constituted in the environment where the access points exist.
  - An ad-hoc network is constituted between mobile hosts.
  - Mobile hosts that are in the area unreachable the radio wave from the access point can connect to the Internet.

## Overview



## Configuration of a Ad-hoc Network

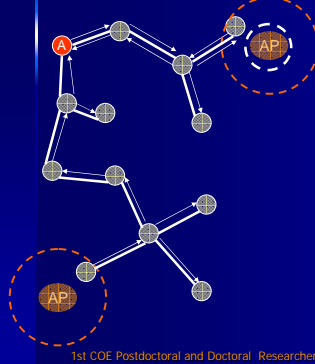


1. Host A broadcast the packets to neighbor hosts.
2. Neighbor hosts send the reply packets to host A.
3. Host A and neighbor hosts are established connection.
4. Other terminals establish connection in the same operation.

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## Communication to the Access Point



1. Each hosts relays the beacon of AP.
2. Host A receives this beacon from neighbor hosts and acquires the information of AP.
3. Host A selects the AP and sends the query packets to AP.
4. Hosts intermediate this query packet and this packet is sent to AP.

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## Selection Problem of Wireless Hot Spots

### ➤ Which routes is selected when two or more access points are detected?

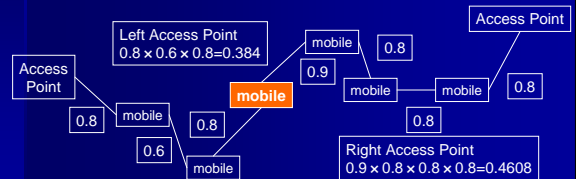
- Necessary to select the access point that communicates.
- Selection Criteria
  - The number of hops on wireless multi-hop network
  - The intensity of the radio wave
  - The number of hosts using an access point
  - The place located the access point

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### ➤ Which access point is appropriate?

- The number of hops is fewer
  - There is little influence by movement of other hosts, since there are few intermediate hosts.
- The intensity of radio wave is strong
  - As shown in the following figure, radio wave intensity is calculated, and it uses for access point selection.



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## Simulation

- Measurement item
  - The relation of the number of hops and communication time
- Simulator
  - Network Simulator NS-2(ver 2.26)

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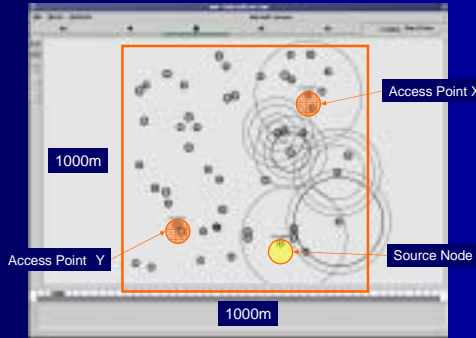
## Conditions of Simulation

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

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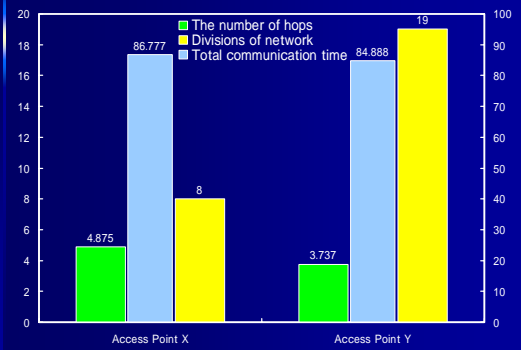
## Simulation



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## Simulation Result(1)

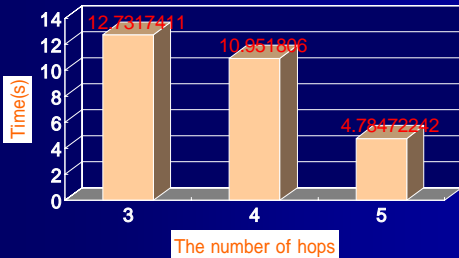


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## Simulation Result(2)

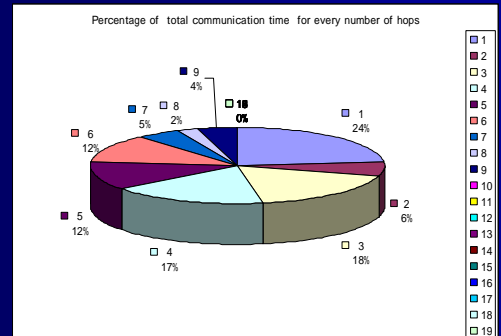
The relation of the number of hops and communication time



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## Simulation Result (3)



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## Consideration of the Simulation

- Simulation Result (1) (2)
  - These results are results in a certain scenario.
    - If the number of hops is small, the communication time becomes long.
    - However, it turns out that the number of times of the division of routes influences greatly.
- Simulation Result (3)
  - This result shows the relation between the number of hops and the communication time.
    - The communication time becomes long when the route of smaller hop is selected.

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## Conclusion

- I have proposed the wireless peer-to-peer system using the ad-hoc network to the access point.
- Moreover, I have proposed about the structure that selects the suitable wireless hot spot.
  - I have simulated to inquire stability of communication routes in terms of the number of hops.
  - As simulation results, stability of communication routes is more depended on the number of divisions of network than the number of hops.

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18