Chapter 11:
Introduction to Mobile Ad Hoc Network (MANET)

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Model of Operations

Figure 1.1. An Ad Hoc Network of Mobile Nodes
Assumptions

- **Symmetric Links:**
  - unidirectional links are difficult to deal with, and sometimes at the verge of failure

- **Layer-2 Routing:**
  - Most protocols are presented in layer-3 routing, but can be easily retooled as a layer-2 ones.

- **Proactive vs. Reactive Protocols**
  - (to be elaborated later)
Applications

- Ad hoc conferencing
- Home networking
- Emergency services
- Personal area network (PAN)
- Ubiquitous computing

- “computers are all around us, constantly performing mundane tasks to make our lives a litter easier”
- “Ubiquitous intelligent internetworking devices that detect their environment, interact with each other, and respond to changing environmental condition will create a future that is as challenging to imagine as a science fiction scenario.”
Sensor Dust: (wireless sensor network)
- a large collection of tiny sensor devices
  - once situated, the sensors remain stationary
  - largely homogeneous
  - power is likely to be a scarce resource, which determines the lifetime of the network
- can offer detailed information about terrain or environmental dangerous conditions.

Automotive Integration:
- may be integrated with positioning devices
Technical Factors

- Scalability
- Power budget vs. latency
- Protocol deployment and incompatibility standards
  - “Unless a miracle happens (e.g., the IETF manet working group is able to promulgate a widely deployed ad hoc networking protocol), ad hoc networks will gain momentum only gradually because users will have to load software or take additional steps to ensure interoperability.

- Wireless data rate
  - e.g., TCP over multi-hop wireless links

Security issues
More Extensions (DoD’s Perspective)

- Could be a group of hosts supported by one or more radios
- Could across the Internet
IETF MANET Working Group

Goal:

- To standardize an interdomain unicast routing protocol which provides one or more modes of operation, each mode specialized for efficient operation in a given mobile networking “context”, where a context is a predefined set of network characteristics.

- A dozen candidate routing protocols have been proposed.
IETF MANET Routing Protocols

- Mobile Ad-hoc Networks (manet) Working Group
  (http://www.ietf.org/html.charters/manet-charter.html)
  - The Zone Routing Protocol (ZRP) for Ad Hoc Networks (38377 bytes)
  - Ad Hoc On Demand Distance Vector (AODV) Routing (84395 bytes)
    The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (192667 bytes)
  - On-Demand Multicast Routing Protocol (ODMRP) for Ad-Hoc Networks (59372 bytes)
  - Topology Broadcast based on Reverse-Path Forwarding (TBRPF) (112739 bytes)
  - Landmark Routing Protocol (LANMAR) for Large Scale Ad Hoc Networks (50155 bytes)
  - Fisheye State Routing Protocol (FSR) for Ad Hoc Networks (38463 bytes)
  - The Interzone Routing Protocol (IERP) for Ad Hoc Networks (40534 bytes)
  - The Intrazone Routing Protocol (IARP) for Ad Hoc Networks (32486 bytes)
  - The Bordercast Resolution Protocol (BRP) for Ad Hoc Networks (35570 bytes)
Applications of Ad Hoc Networks
Network Architectures

- Infrastructure:

- No Infrastructure (ad hoc networks):
  - no base stations; no fixed network infrastructure
MANET = Mobile Ad Hoc Networks

- Multi-hop communication
- Needs support of dynamic routing protocols
Nokia Rooftop Product
Nokia RoofTop

- RoofTop solution (Nokia, Finland)
  - Wireless router
    - a radio frequency (RF) modem
    - a digital Internet protocol (IP) router
FHP

- FHP Wireless, USA
- Ad hoc network in a campus
FHP Wireless
MeshNetworks, USA
MeshNetworks

- Architecture
Networking Scenario (III) : To Internet

Click on the buttons below to navigate through our tour, and learn more about the capabilities of MeshNetworks’ mobile broadband solution.

Members of a peer-to-peer group can also hop onto the Internet or telephone network anytime.
Homework #11:

1. What’s mobile ad hoc network?
2. What’s possible applications of mobile ad hoc networks?