Introduction to Wireless Networks

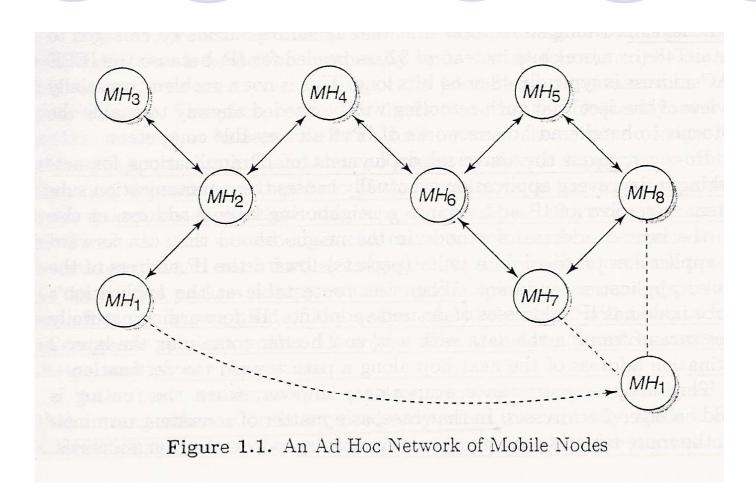
Chapter 9: Introduction to Mobile Ad Hoc Network (MANET)

Prof. Yuh-Shyan Chen Department of CSIE National Taipei University





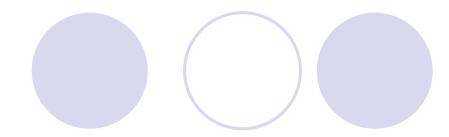
Model of Operations







Assumptions



- Symmetric Links:
 - unidirectional links are difficult to dealt 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)

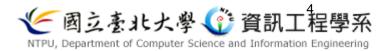




Applications

- 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
- or environmental dangerous conditions.
- Automotive Integration:
 - may be integrated with positioning devices





Technical Factors

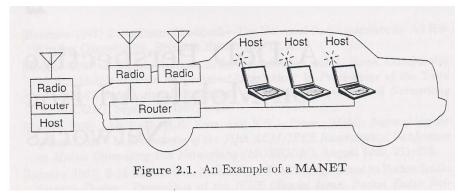
- Scalability
- Power budget vs. latency
- Protocol deployment and incompatibility standards
 - "Unless a miracle happens (e.g., the IETF manet working group is able to promulgate a widely deployed ad hoc networking protocol), ad hoc networks will gain momentum only gradually because users will have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



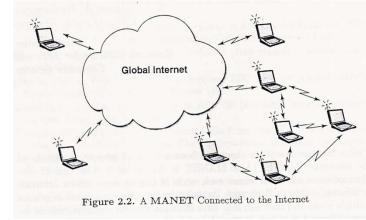


More Extensions (DoD's Perspective)

 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.





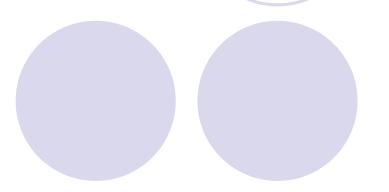
IETF MANET Routing Protocols

- 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



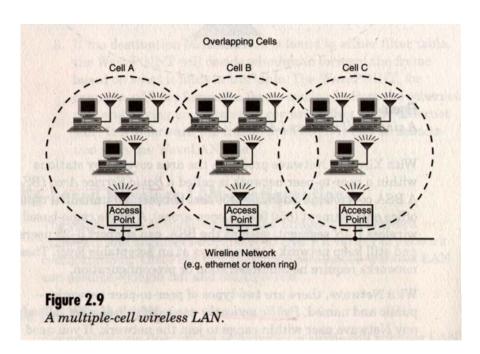




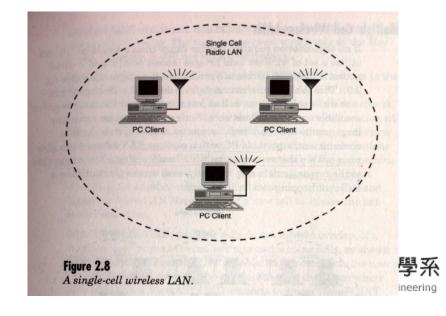


Network Architectures

Infrastructure:

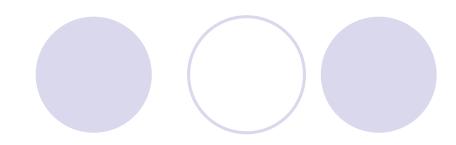


- No Infrastructure (ad hoc networks):
 - no base stations; no fixed network infrastructure

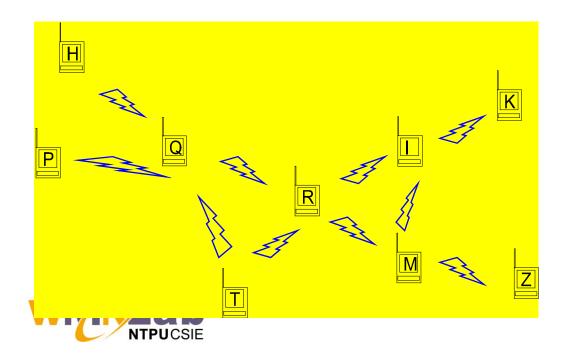






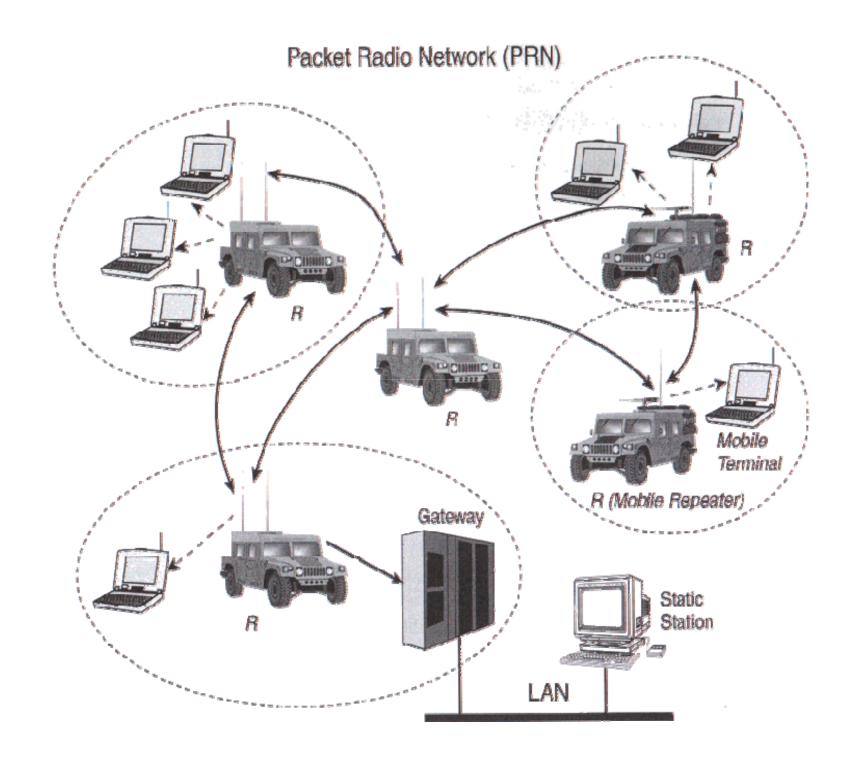


- MANET = Mobile Ad Hoc Networks
 - Multi-hop communication
 - Needs support of dynamic routing protocols

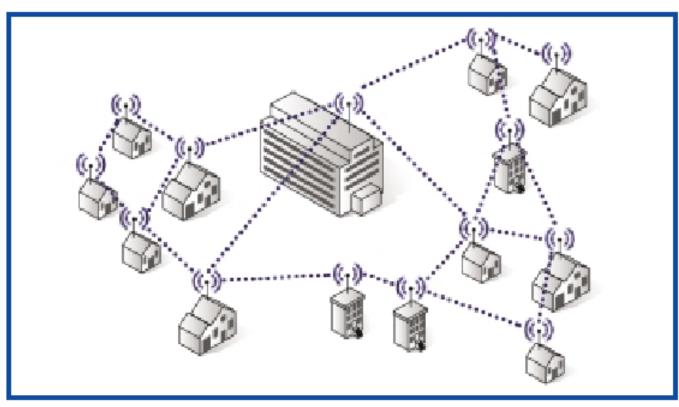




NTPU, Department of Computer Science and Information Engineering



Nokia Rooftop Product



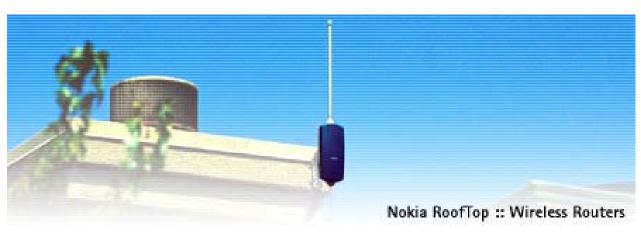






Nokia RoofTop

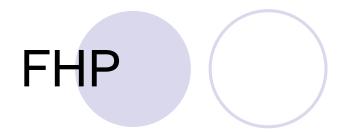
- RoofTop solution (Nokia, Finland)
 - Wireless router
 - a radio frequency (RF) modem
 - a digital Internet protocol (IP) router

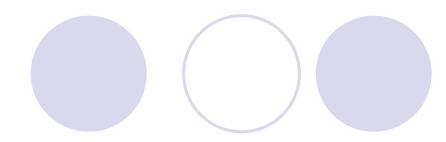




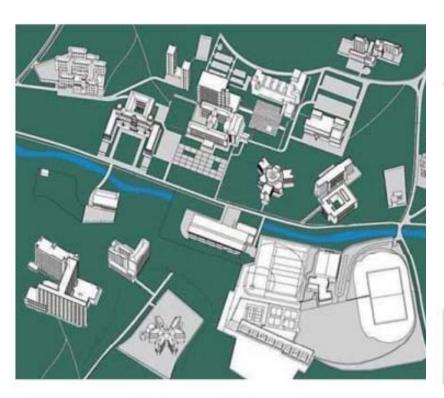








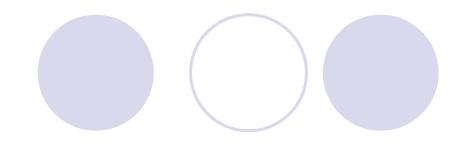
- FHP Wireless, USA
- Ad hoc network in a campus

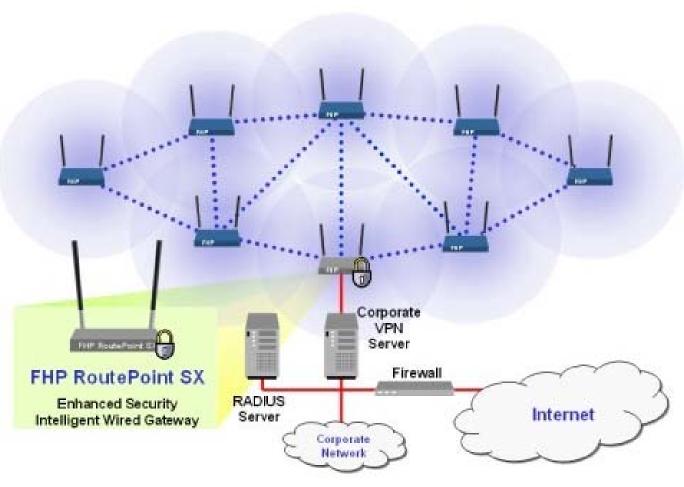




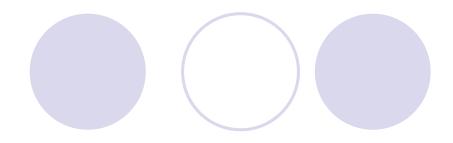


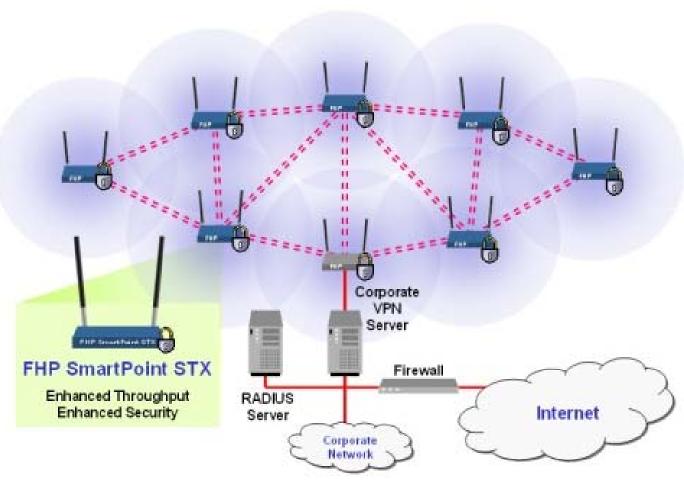
FHP Wireless





FHP Wireless







MeshNetworks

MeshNetworks, USA

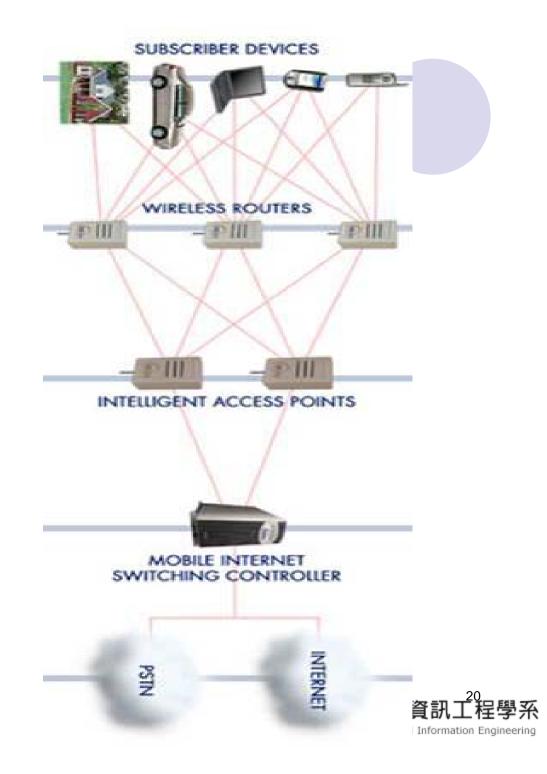






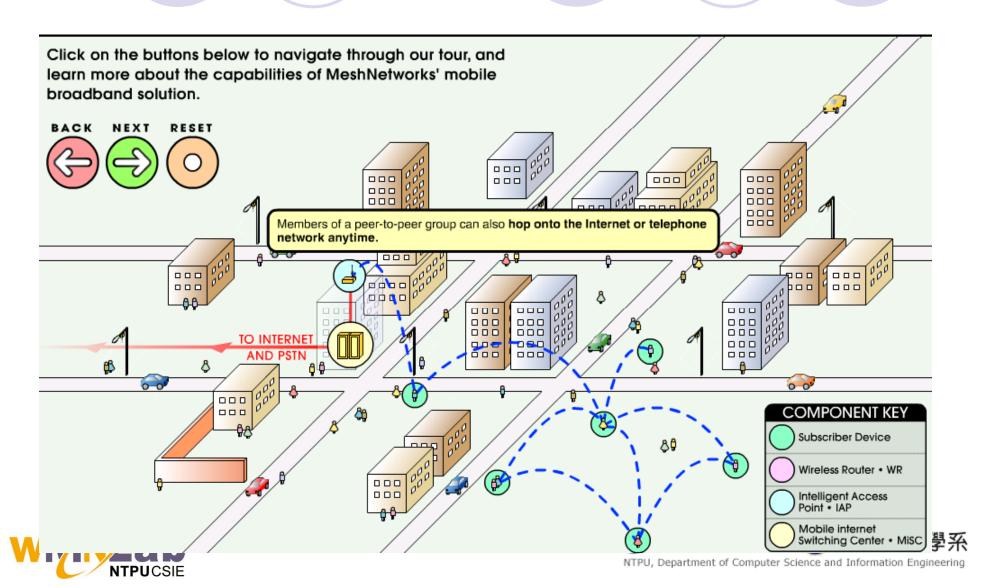
MeshNetworks

Architecture

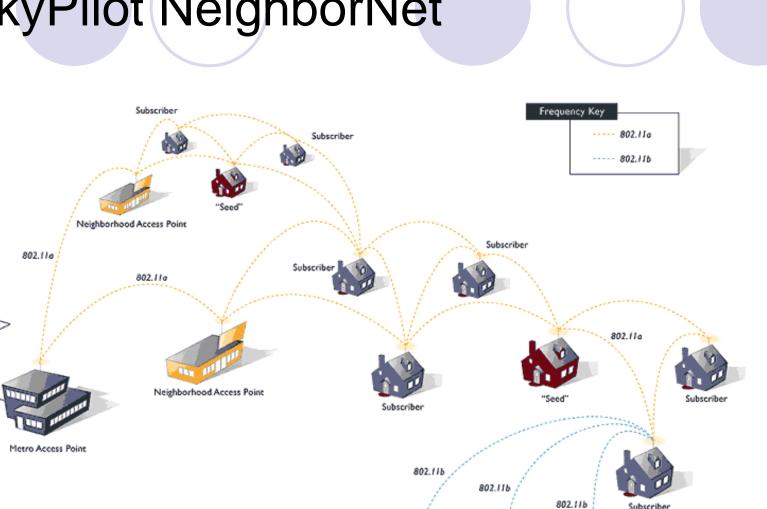




Networking Scenario (III): To Internet



SkyPilot NeighborNet



Cable TV

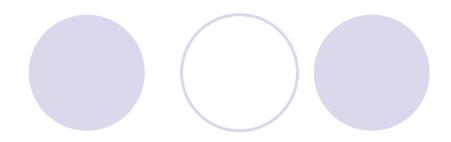


Subscriber

Wireless LAN

Internet Access

Homework #9:



- What's mobile ad hoc network?
- 2. What's possible applications of mobile ad hoc networks?



