Wave Relay System and General Project Details

Wave Relay System

- Provides seamless multi-hop connectivity
- Operates at layer 2 of networking stack
- Seamless bridging
  - Emulates a wired switch over the wireless network
  - Each Wave Relay router has an Ethernet port
    - You can plug a single device OR a whole network of devices into the Ethernet port
- Wave Relay software can also run on a Linux laptop
  - Installs as a kernel module on 2.4 or 2.6 kernels
- Creates a Virtual Interface
  - Packets sent to eth0 go out the wire directly
  - Packets sent to waverelay0 are routed through the ad hoc network
  - Packets sent to wlan0 will only reach nodes within a single hop!

Wave Relay Details

- Uses the Pulse Protocol for routing
  - Tree based routing protocol
  - High scalability
    - Number of nodes, number of flows, mobility
  - Energy efficiency NOT implemented
    - System designed strictly for high performance
  - Simulated in NS2 simulator
    - Simulations with up to 5,000 nodes
    - Mobility up to 50 m/s
- Uses the Medium Time Metric
  - Selects high throughput paths
  - Designed for multi-rate networks
  - Paths selected are less likely to break

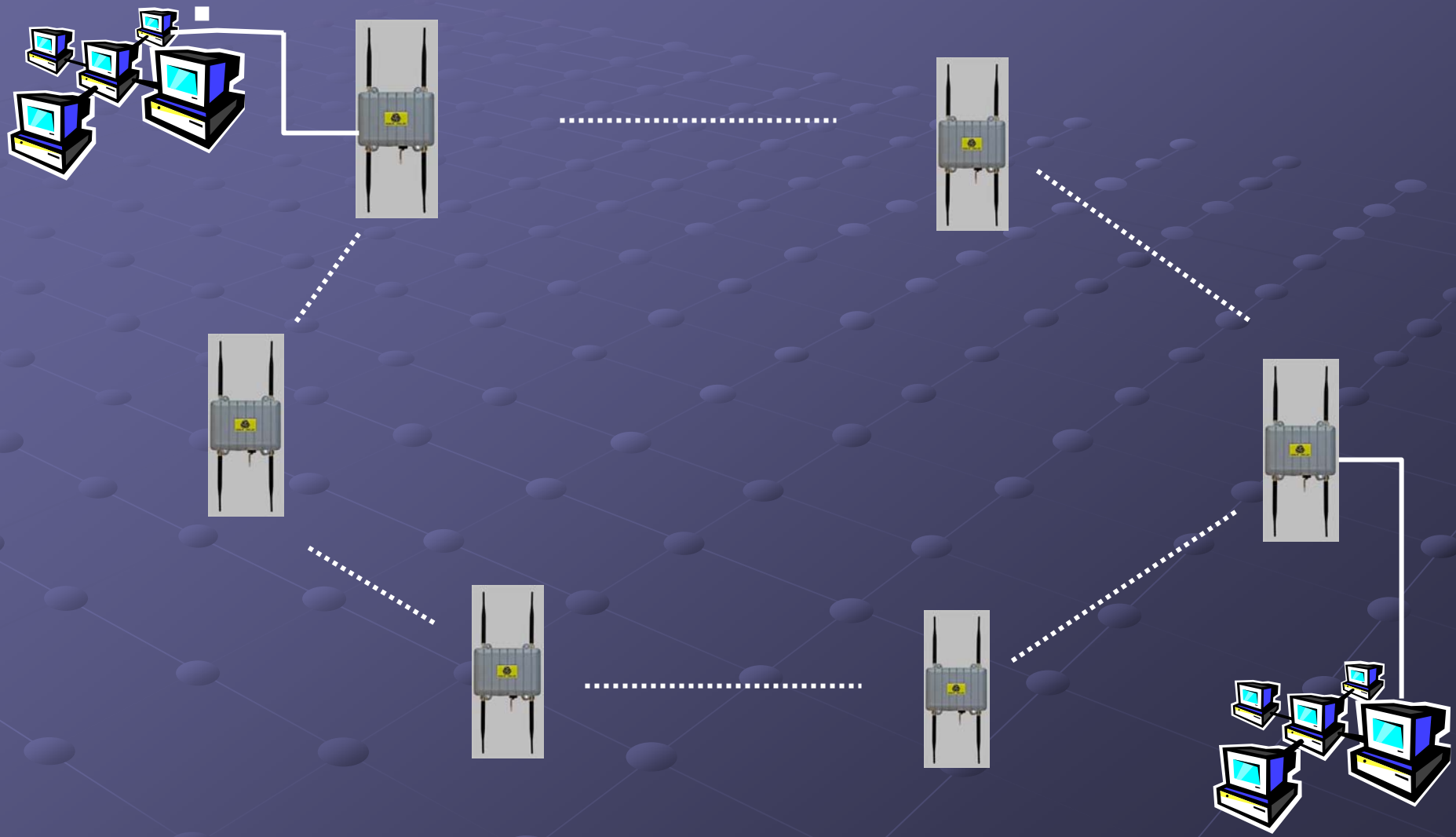
Further Information

- Publications related to Pulse Protocol and Medium Time Metric available on website.
- http://www.cnds.jhu.edu/archipelago/
- Pulse Protocol implementation is a little different from what is in the papers.
- We will talk more about the protocol when we cover routing

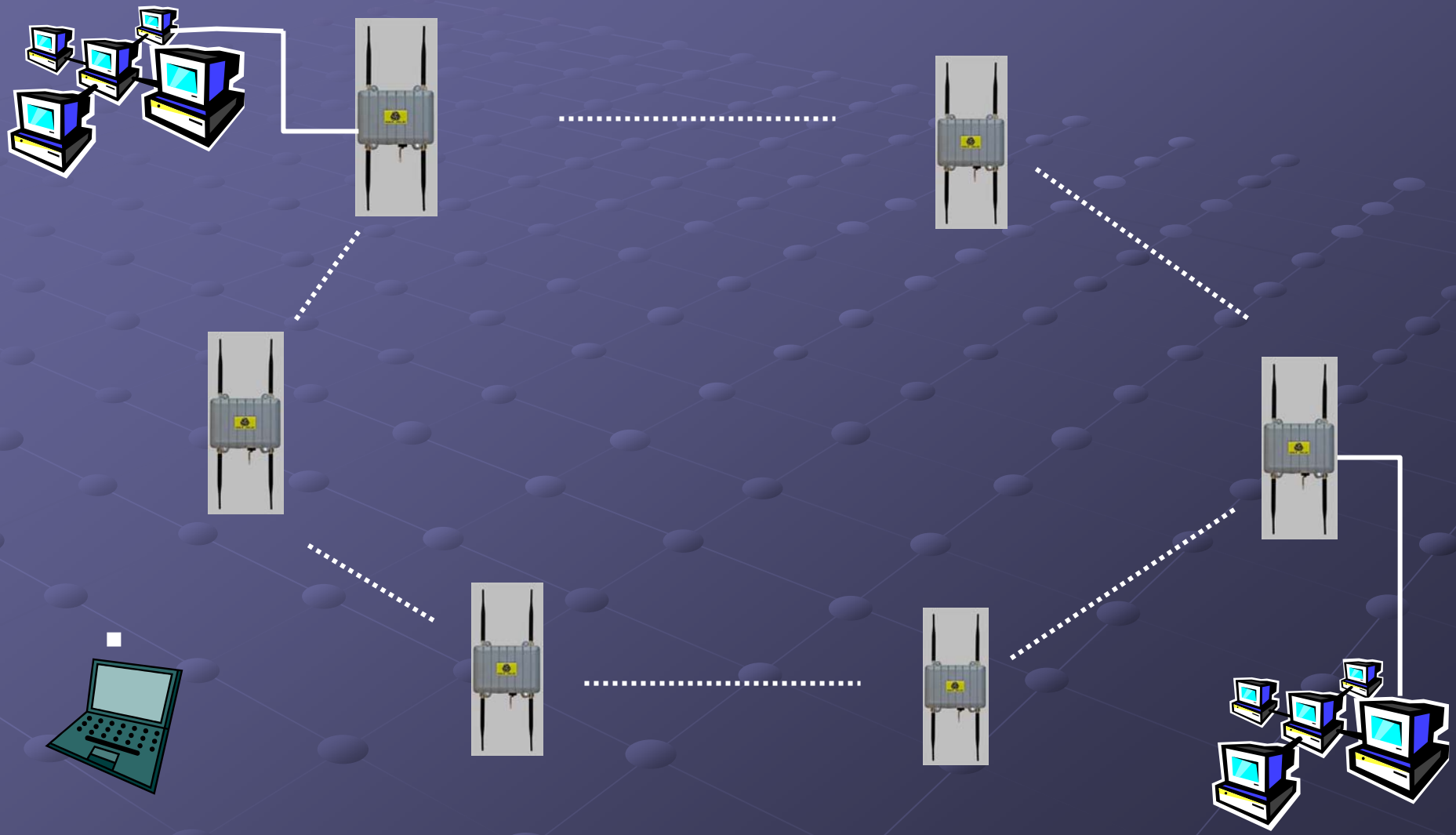
Wave Relay Software

- Wave Relay software is NOT open source
- We will help compile/install the software on your machine
- You will be able to start it and stop it
- Please do not distribute the software even in binary form

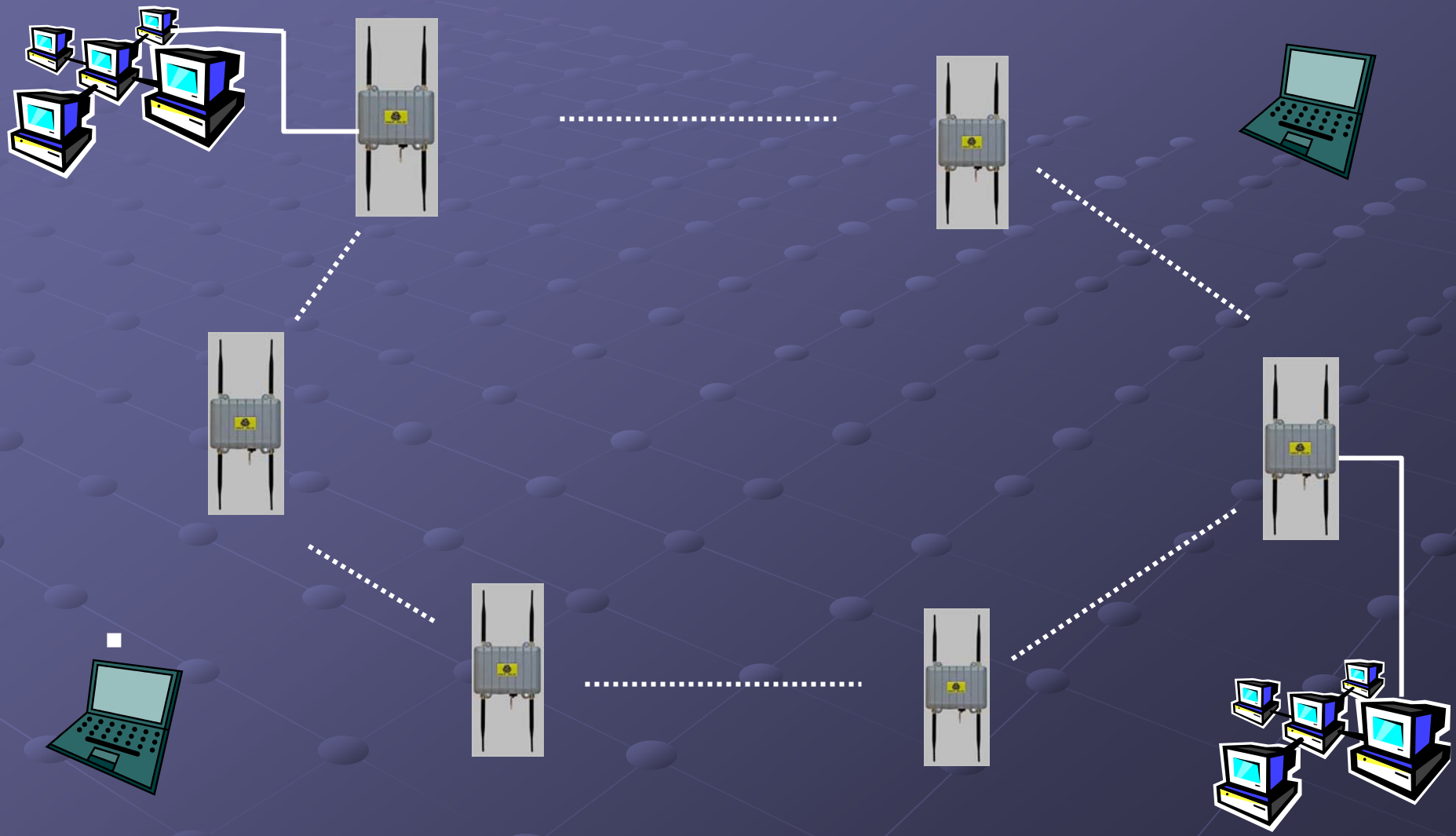
LAN to LAN Bridging Example



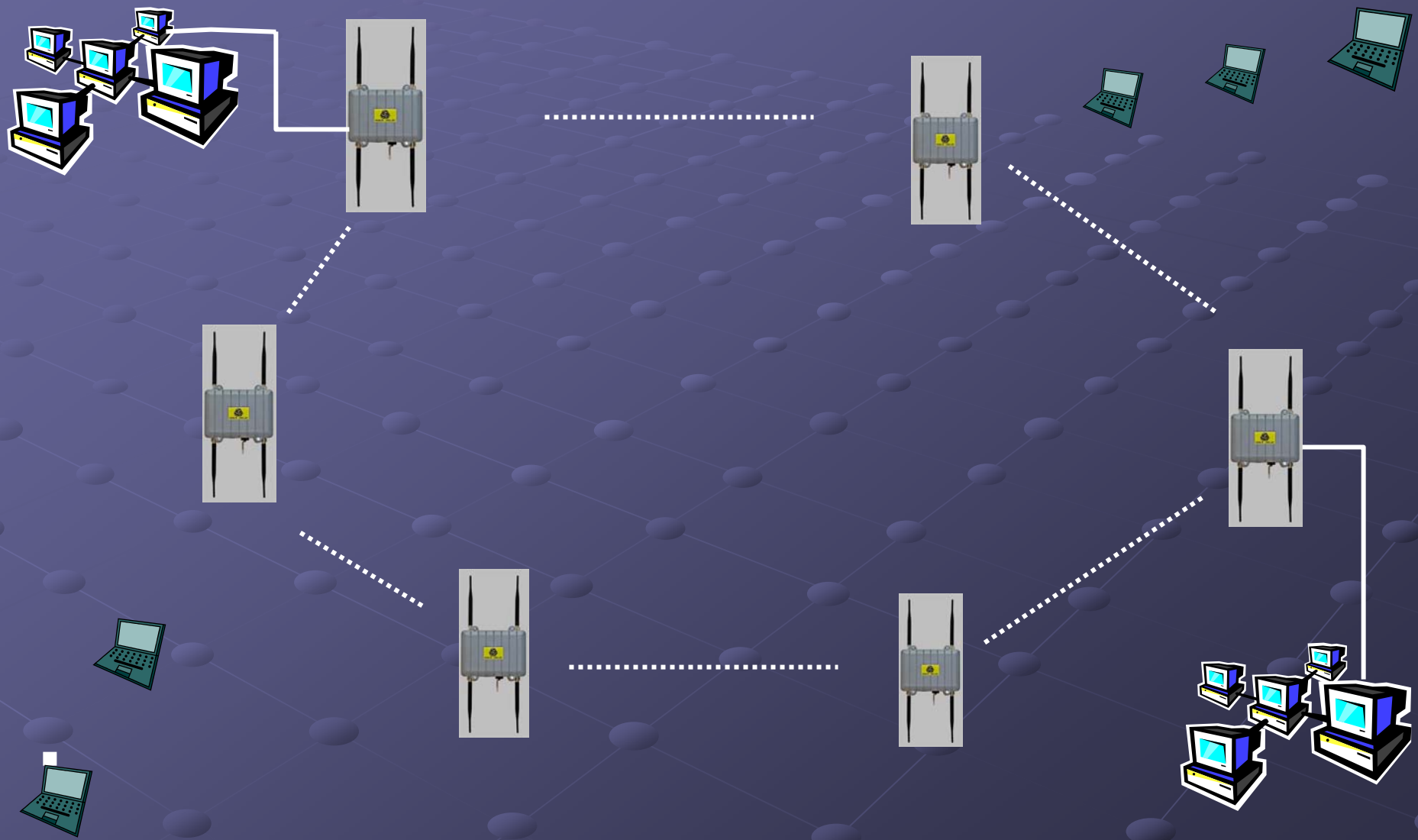
Wireless to LAN Example



Wireless to Wireless Example



Wireless to Wireless Example



What you'll be doing…

- Writing a mobile network application
- It should be extremely similar to writing a network application which operates between wired nodes on a switch
- Main Differences:
  - If you send a broadcast packet to the waverelay0 interface, it will be delivered with best effort, to ALL nodes in the network.
    - Similarly, if you send a broadcast packet to a switch on a wired network, it goes out all ports!
  - In many of your applications you might want to coordinate locally
    - We have a designated broadcast address which only delivers broadcasts to nodes within 1 hop
    - More details on this later

Hardware

- Wireless Cards: Prism 2.5 based 200 mW 802.11b devices
- Let us know if you have a laptop with:
  - Linux 2.4 or 2.6 kernel (NOT OSX or BSD)
  - A PCMCIA slot
  - If you do, we will order a wireless card for you to use during the class
- If your project requires a GPS receiver:
  - You must ALSO have a serial port on your laptop
  - My IBM R40 does NOT have a serial port
  - IBM T –series generally DO have a serial port
  - Check your machine. And let us know if you need it for your project.

Drivers

- The driver we use for the Prism 2.5 wireless cards is the HostAP driver
- http://hostap.epitest.fi/
- Everyone needs to be using the same wireless card and driver for the class
- Wave Relay interacts with Host AP driver and requires it to function properly
- Link to HostAP driver is on class website

Questions from people in class

- Am I writing software to run on those embedded Wave Relay devices?
  - In general no. Your software for the most part will run on your laptops, and only be routed across the Wave Relay network.
  - If you had a daemon application that you needed to run on the embedded device talk with us.
- Can I write a routing protocol or network simulation?
  - No, in this class we only want people developing mobile applications.
  - If you are interested in these types of things come by the lab and talk to us. Future independent study, qualifying project, research etc.
- Can I write an application that runs on a cell phone?
  - No, we want the applications to run over 802.11.
  - We don't have access to cell phones for the class.
- Will Wave Relay run on Mac OSX?
  - Wave Relay is a Linux Kernel module so it will not run on OSX
  - You can install Linux on a Mac and potentially run Wave Relay
    - I have not tried this
- Can I use programming language <fill in the blank> ?
  - Always use the best tool for the job
  - Talk to the members of your group to make sure everyone knows the language!
  - No you can't use Logo.
- Does my program need to run as a kernel module or interact with kernel modules?
  - NO just use standard socket programming
- Can I use my own wireless card?
  - No, we want everyone in the class using the same wireless card.
  - Required to use Wave Relay, and easier to track down problems in general.

Upcoming Tasks

- When wireless cards arrive, install them with Host AP driver
  - If you have problems come by the lab and we can help (NEB 213).
- Form groups and select the project you would like to work on
  - Many of you have already started doing this
- Create a webpage for your project
  - Project name, group members, extended description of the project
  - Webpage should be frequently updated throughout the semester
- Create a project Design Document
  - Extensive description of the project with all of the intended functionality
  - Break project down into a collection of tasks
    - Different group members should be responsible for different tasks
    - Tasks can be for various components, testing, user interface, features, etc.
- Check the website for updated due dates