

# How to Shop for Wireless Equipment

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# Goals

- To be aware of important criteria for selecting a certain product
- To be able to tell “marketing talk” from the truth
- To be aware of the price range of common wireless products

# Table of Contents

- Scope
- Criteria for selecting standard and hardware
- Types of Wifi hardware
- Anatomy of an AP/Router
- Features to consider
- Some recommendable products

# Scope

- Wifi applies to all IEE **802.11** sub-standards that is certified by the Wifi Alliance.

Standard	Frequency	Raw data rate	Modulation
802.11a	5.2 GHz	54 Mbps	OFDM
802.11b	2.4 GHz	11 Mbps	DSSS
802.11g	2.4 GHz	54 Mbps	OFDM, PBCC

# Basic Criteria

- What do you want to do?
- What is your budget?
- What equipment is available?

# Criteria for standards

- Robustness (mature standard, modulation technique)
- Price (mature standard, mass market)
- Indoor vs outdoor (polling, frequency)
- Short vs long links (frequency)
- Legal considerations (frequency)

# Criteria for products

- Robustness
- Price and availability
- Power consumption
- Environmental consideration
- Support for your system

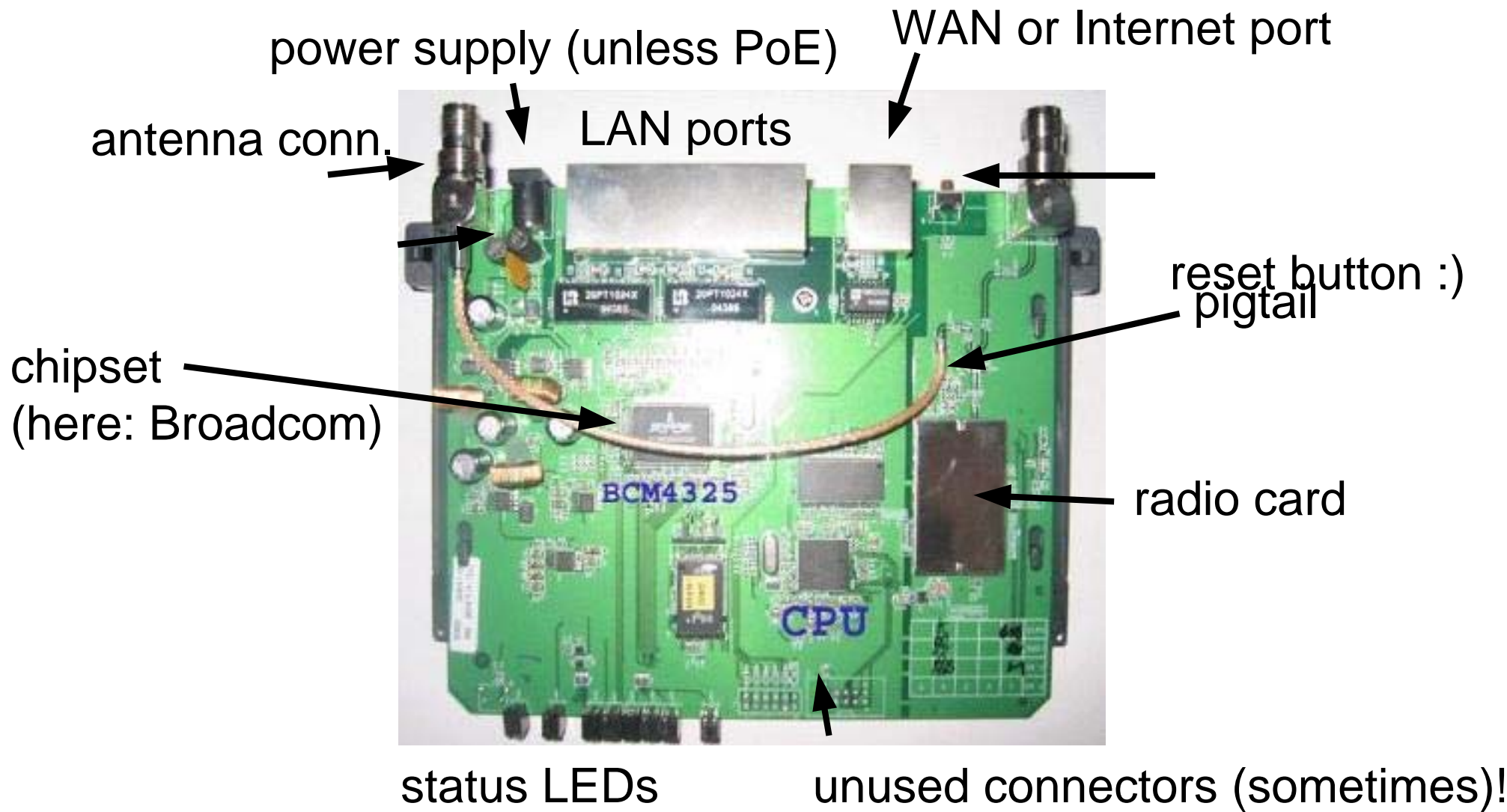
# Type of Products

- Access points (DSL and cable products)
- Cellular Convergence
- Compact Flash
- Embedded clients
- Ethernet Client devices

# Type of Products

- External cards (PC card, PCMCIA, Cardbus, SD)
- Internal cards (MiniPCI card, PCI card)
- PDAs
- USB Client Device (Dongle, Adapter)
- Wireless Printers (print servers)

# Anatomy of an AP/Router



# Types of Products

- Never a strict line between types of hardware
  - Build and modify yourself
- Think of:  
radio + chipset + surrounding hardware +  
software  
+ all externals (antennas, power supply)

# Features

- Bandwidth (modulation)
- Reach/Coverage (frequency)
- Output power
- Receive sensitivity
- Antenna (internal/external, gain)

# Features

- Chipset
- Security features
- Power over Ethernet (PoE, IEEE 802.3af)

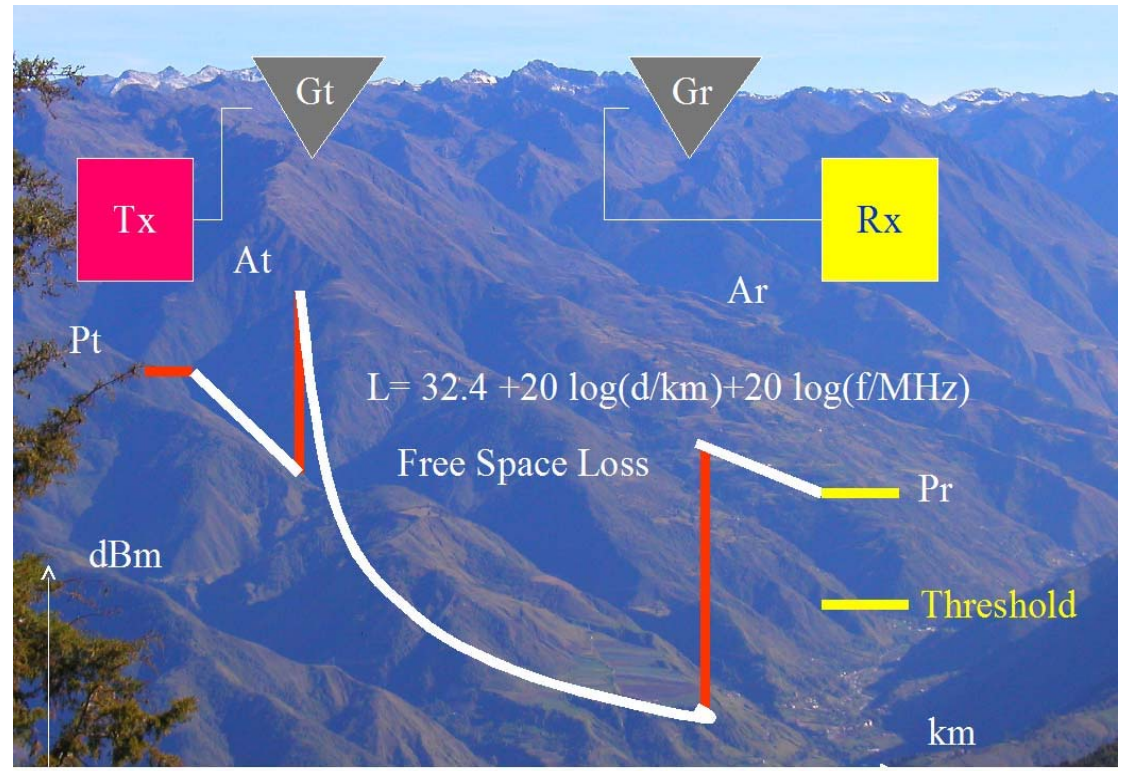
# Features: Output and Sensitivity

## Receive Sensitivity:

- 94dBm at 1 Mbps;
- 88dBm at 2 Mbps;
- 87 dBm at 5.5 Mbps;
- 84dBm at 11 Mbps

## Output Power:

- +17.5dBm (max) to
- +11.5dBm (min)



# Product Presentation

- Focus mostly on infrastructure related hardware
  - Access points, gateways, bridges, PtP links
- The examples are a personal pick of the author based on an overview of many international projects
- There are many many more vendors

# Product Presentation

- Pricing info is meant as a rough first orientation
  - prices change fast and are extremely dependent on quantity
- Local availability, pricing and skills easily can be the most important buying points
- Antennas are not being covered here (see Antennas and Cables)

# PC Client Cards

- Lots of vendors
- Older cards supports 802.11b, g/b
- Newer cards are typically a/b/g and based on Atheros chipset
- Some are equipped with antenna connectors
- Radio quality (output, sensitivity) varies a lot!

# PC Client Cards

Vendors worth looking

- Avaya (ex Orinoco)
  - Old b cards
- Senao
  - 200 mW cards
  - External antenna
- Linksys
- D-Link



# Linksys

- Home user equipment that can do much more things
- Hard to beat in price/performance
- Some of their gear runs on GPLed Linux firmware
  - Linksys WRT54G (b+g standards)
  - A growing number of firmware hacks exist
  - Mesh implementations
- Comparable vendors in the low price range
  - D-Link and Netgear

# Linksys

- Good entry points for WRT54G info:

[http://www.talug.org/events/20050115/Wireless\\_Linux/WRT54G\\_fil](http://www.talug.org/events/20050115/Wireless_Linux/WRT54G_fil)

<http://www.seattlewireless.net/index.cgi/LinksysWrt54g>

- Price

- APs from \$50

- Client cards from \$40

*URL: [www.linksys.com](http://www.linksys.com)*

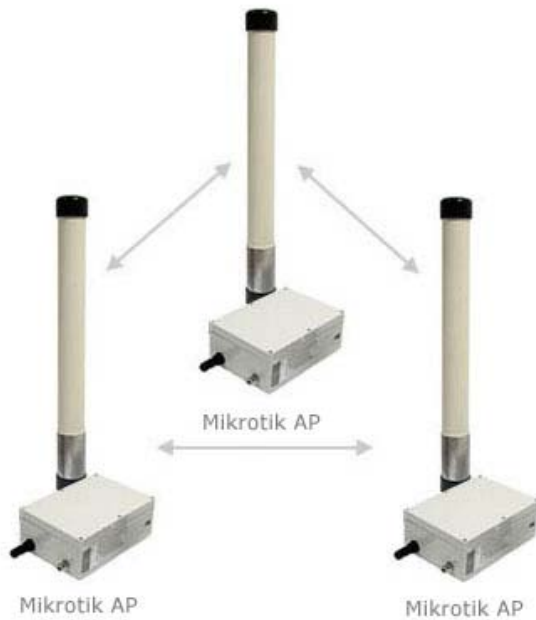


# Mikrotic

- Latvian company
- Makes 2.4/5 Ghz routers, boards and WISP oriented software
- Very interesting multi-radio (a/b/g) configurations
  
- Price
  - APs from \$500
  - PtP link from \$1000

# Mikrotic

*URL: [www.mikrotic.com](http://www.mikrotic.com)*



Last updated: 26 April  
2006  
Collection: Duettrick

ItrainOnline MMTK: [www.itrainonline](http://www.itrainonline).

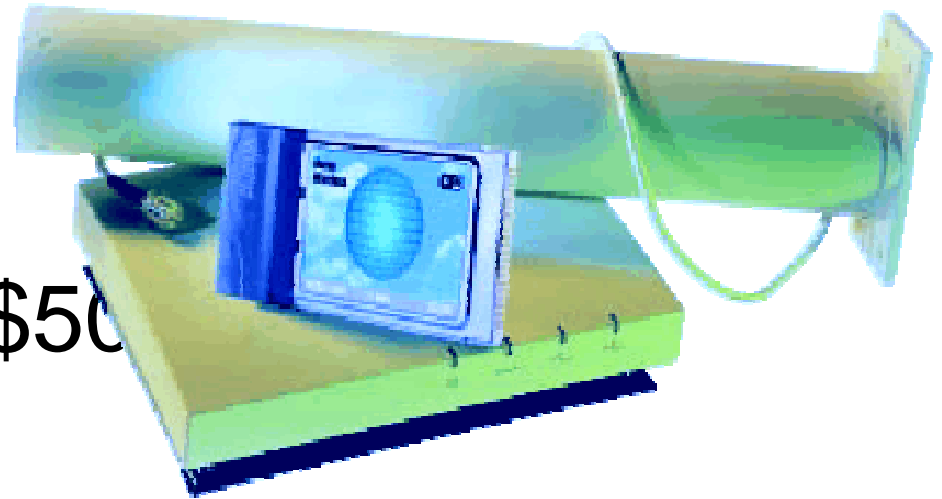
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# Orinoco/Avaya

- Lucent cards, APs and outdoor routers where among the first widely deployed 802.11b systems
- Name changed to Proxim and then Avaya
- Lucent or Avaya Silver and Gold cards (802.11b) are an excellent pick, stable and of high radio quality

# Orinoco/Avaya

- Price
  - APs from \$300
  - Client cards from \$50



*URL: [www.avaya.com](http://www.avaya.com)*

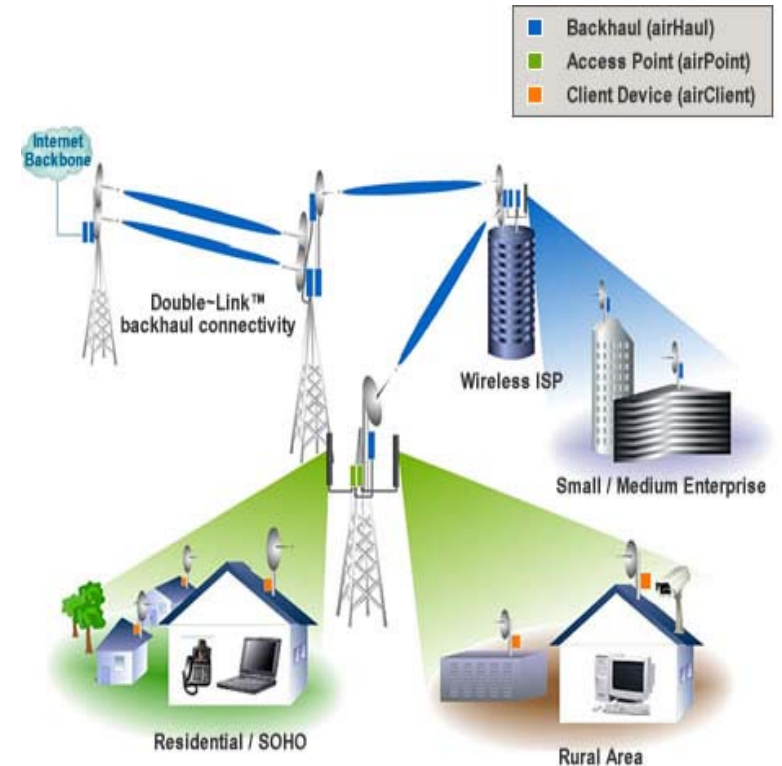


# Smartbridges

- Very good series of point to (multi) point links (airhaul), APs (airpoint) and clients
- Good global distribution, track record of rural deployments, incl. Mt. Everest
- Rated -40 ... +65 Celsius

# Smartbridges

- Price
    - AP from \$200
    - Links from < \$400
- URL: [www.smartbridges.com](http://www.smartbridges.com)*



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2006  
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ItrainOnline MMTK: [www.itrainonline.com](http://www.itrainonline.com)

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# Motorola Canopy

- Products in (900 MHz), 2.4 GHz and 5 GHz bands
- Focus on WISP, carriers, enterprise
- Point to point and multipoint links
- Proprietary (non-802.11) modulation
- Very robust

# Motorola Canopy

- Price
  - From \$400-\$500 per end
  - 150 for reflector

*URL: [www.motorola.com/canopy/](http://www.motorola.com/canopy/)*

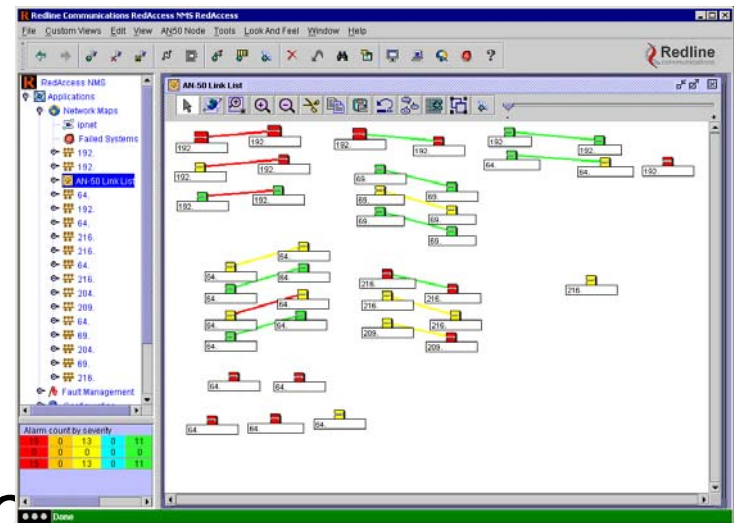


# Redline

- Redline Communications systems
  - Point-to-point
  - Point-to-multipoint
  - Backhaul, public access, and private network
- Operator solutions are available for the licensed 3.5 GHz band, and the unlicensed 5.4 GHz and 5.8 GHz bands.

# Redline

- Price from \$3500-\$7000 per radio, plus software licenses



*URL: [www.redlinecommunications.com](http://www.redlinecommunications.com)*

# 4G Access cube

- A small 2-4 radio Linux mesh box
- Dimensions: small (7x5x7cm) cube
- Waterproof outdoor casing
- No moving parts
- Low power consumption (ca. 4W)
- Power over Ethernet (802.3af standard)
- Up to 4 WLAN (802.11a/b/g) interfaces
- 400 MHz MIPS processor AMD Au1500  
aka Alchemy
  - 32MB flash, 64MB RAM, USB host, USB device

# 4G Access cube

- Price from \$250 (2 radios)

*URL: <http://meshcube.org>  
<http://4g-systems.biz>*



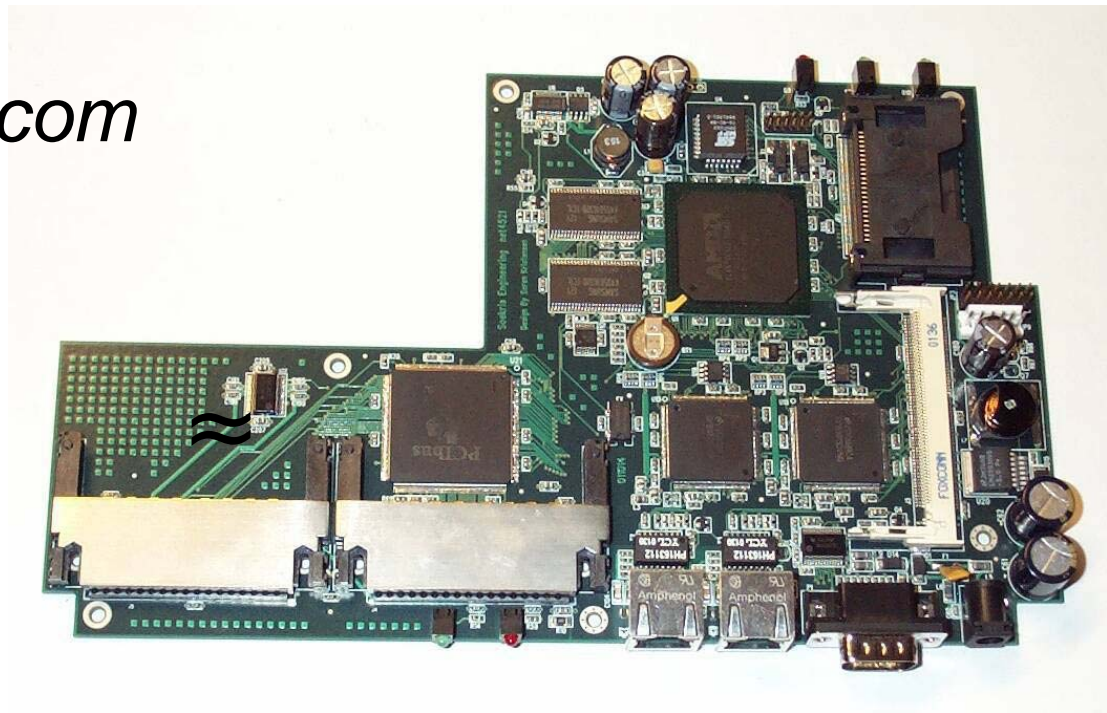
# Soekris boards

- The net4521 board with 2 PC card slots and other Soekris models are popular starting points for building your own wireless hardware
- Great for Linux or BSD

# Soekris boards

- Price from \$150

*URL: [www.soekris.com](http://www.soekris.com)*



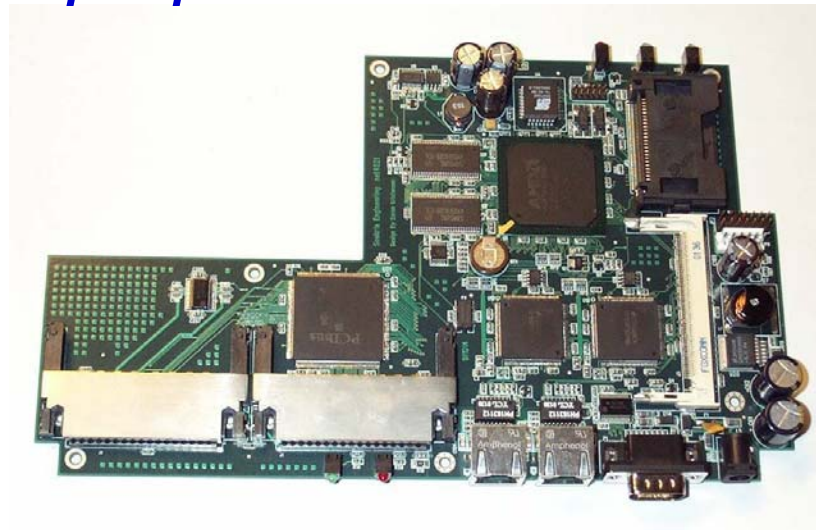
# Do it yourself

- Find a piece of old hardware (e.g. a laptop) and one or two radio cards, start with HostAP drivers or the Pebble distro
- Parts may also be new :)
- Self built wireless components can be of high quality

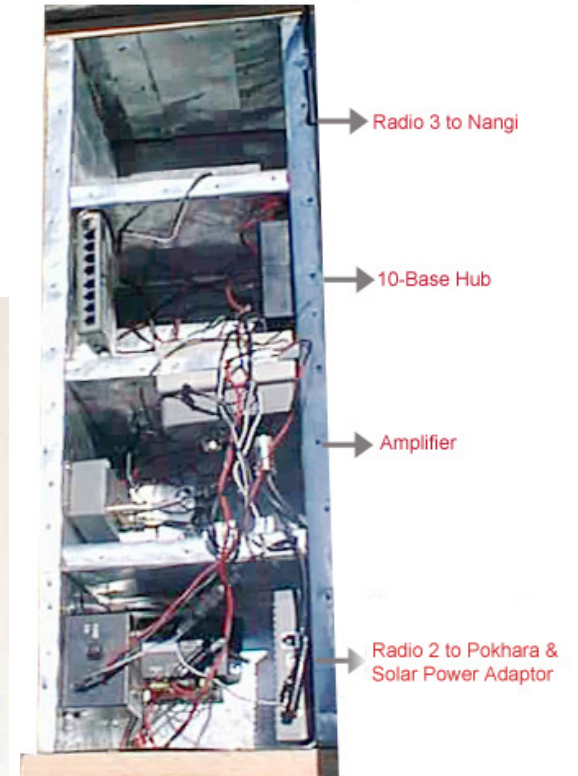
# Do it yourself!

- Price from \$0

*URL: [www.nycwireless.net/pebble](http://www.nycwireless.net/pebble)  
<http://hostap.epitest.fi>*



Relay Box at Mohare for the Wireless Networking in Nepal  
Elevation: 3,320m (~11,000 ft)



# Conclusions

- Have a clear picture of what you want to achieve before going shopping
- Find a product that suits your needs (and budget) and not someone else needs
- Make a prestudy of your options before you make up your mind