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.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Frequency</th>
<th>Raw data rate</th>
<th>Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11a</td>
<td>5.0 GHz</td>
<td>54 Mbps</td>
<td>ODFM</td>
</tr>
<tr>
<td>802.11b</td>
<td>2.4 GHz</td>
<td>11 Mbps</td>
<td>DSSS</td>
</tr>
<tr>
<td>802.11g</td>
<td>2.4 GHz</td>
<td>54 Mbps</td>
<td>OFDM, PBCC</td>
</tr>
</tbody>
</table>
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

- power supply (unless PoE)
- WAN or Internet port
- antenna conn.
- LAN ports
- chipset (here: Broadcom)
- pigtail
- reset button :)
- radio card
- status LEDs
- unused connectors (sometimes)!
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 many more vendors
  • Cisco, 3COM, Gemtek, Tranzeo, Intel, 

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

• Price
  • APs from $50
  • Client cards from $40

URL: 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
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
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
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
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
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://hostap.epitest.fi
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