

Wiring your Office for Wireless

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What Is Wireless

Wireless communication is the transfer of information without the use of wires. The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications). The term is often shortened to "wireless". It encompasses various types of fixed, mobile, and portable two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of wireless technology include GPS units, garage door openers and or garage doors, wireless computer mice, keyboards and headsets, satellite television and cordless telephones

<http://en.wikipedia.org/wiki/Wireless>

Types of Wireless

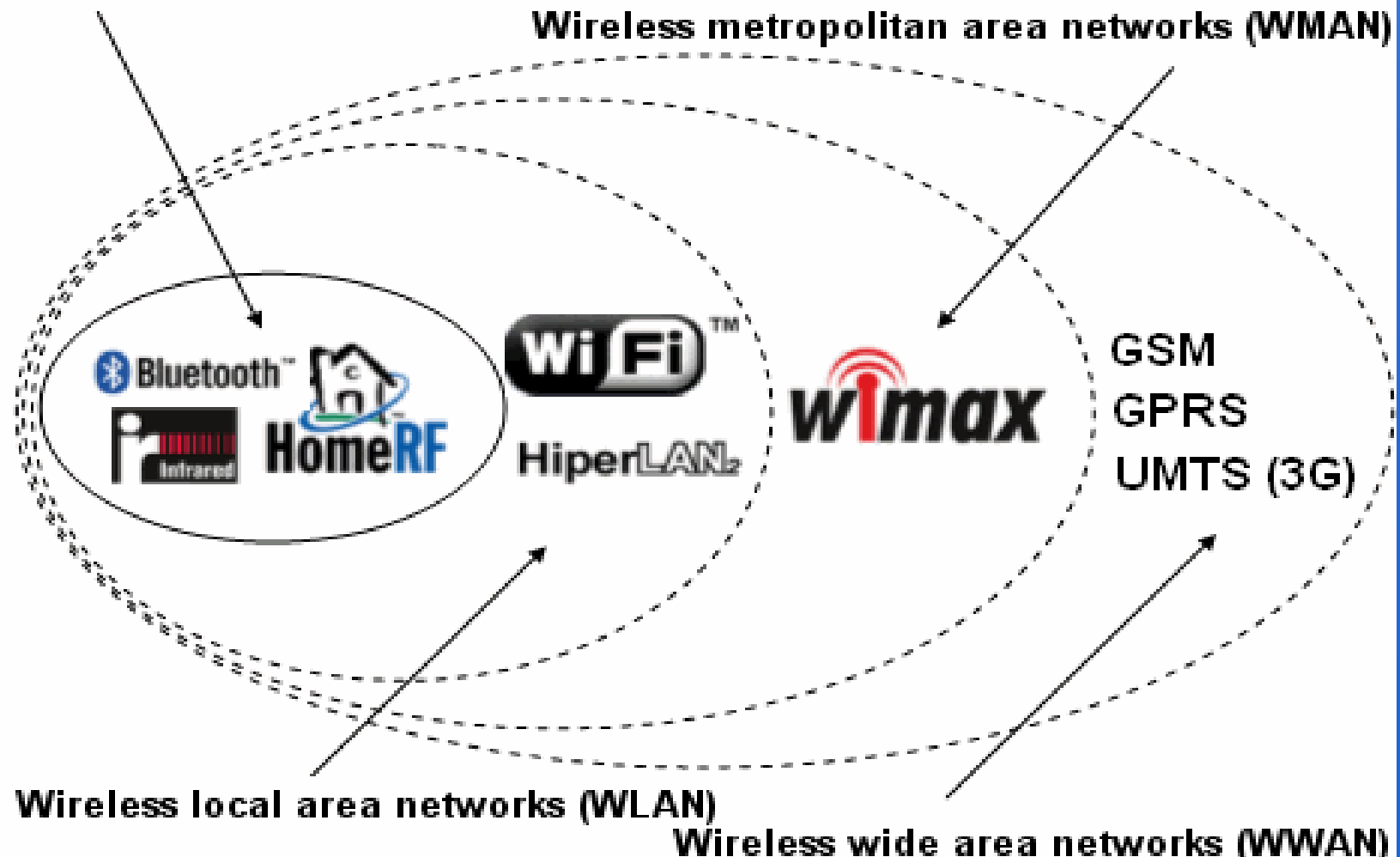
- (WPAN) Wireless Personal Area Network
 - Bluetooth,
- (WLAN) Wireless Local Area Network
 - Wi-Fi IEEE 802.11 legacy, a,b,g,n
- (WMAN) Wireless Metropolitan Area Network
 - Wimax
- (WWAN) Wireless Wide Area Network
 - 3G / 4G cellular

Wireless scope

<http://en.kioskea.net/contents/wireless/wlintro.php3>

Wireless personal area network (WPAN)

Wireless metropolitan area networks (WMAN)



Wireless local area networks (WLAN)

Wireless wide area networks (WWAN)

Wireless Protocol 802.11a

- (WLAN) Wireless Local Area Network
 - Wi-Fi IEEE 802.11 **(a)** yr 1999
- **5 Ghz band**
- max 54 Mbit/s, actual mid-20 Mbit/s
- error correction and encryption
- Smaller range
- Signal absorbed

Wireless Protocol 802.11b

- (WLAN) Wireless Local Area Network
 - Wi-Fi IEEE 802.11 **(b)** yr 1999
- 2.4 Ghz band
- max 11 Mbit/s (higher range / lower speed)
- error correction and encryption
- Most widely used until (g)
- Interference
- Baby monitors, Bluetooth, Cordless Phones

Wireless Protocol 802.11g

- (WLAN) Wireless Local Area Network
 - Wi-Fi IEEE 802.11 (g) yr 2003
- 2.4 Ghz band – 14 channels
- max 54 Mbit/s
- error correction and encryption
- Interference - still
- Baby monitors, Phones / *wireless keyboards*

Wireless Protocol 802.11n

- (WLAN) Wireless Local Area Network
 - Wi-Fi IEEE 802.11 (n) yr 2009
- Multiple Input – Multiple Output
- Channels twice as wide 40 Mhz / 20 Mhz
- 2.4 or 5 Ghz band
- Almost twice range of 802.11g
- Can be as much as 300 / 450 Mbits/s

Wireless LAN protocols

802.11a fast / small coverage

802.11b slow / larger coverage

802.11g fast / larger coverage

802.11n faster / larger coverage

MIMO

802.11n-Draft ?????

Which device(s) to use

- Clearly, use 802.11n (WIFI-N)
 - WAP (Wireless Access Point)
 - Wireless Adapter (client – end user)
 - Wireless Bridge
 - Wireless Switch
 - Wireless Router



Laptops

- New Laptops and Tablets will have WiFi-N
 - a,b,g,n
- Older laptops (more 2 years)
 - a,b,g
- Some laptops do not have wireless
- Desktops normally do not have Wireless

Wireless Adapters

- Internal cards or USB plug-in
 - USB 1.1 is 12 Mb/s and 2.0 is 320 Mb/s
 - Workstations can use it too



Wireless Adapters

- Wireless Keyboards and Mice
 - Wireless RF
 - Cross-talk
 - Less secure
 - Wireless Bluetooth
 - Paired devices
 - Can encrypt

Apple iPad & iPad 2

Wi-Fi model

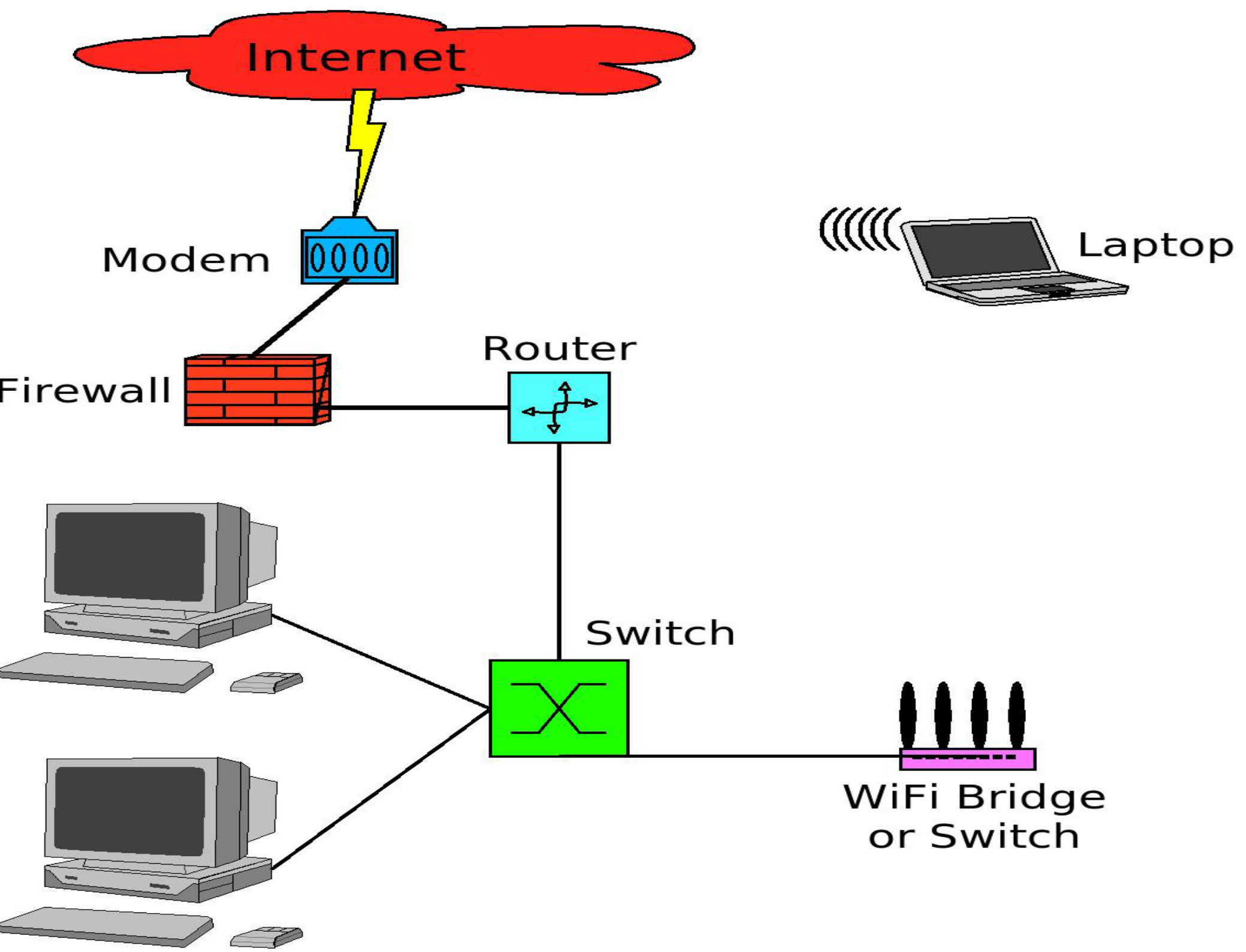
- * Wi-Fi (802.11a/b/g/n)
- * Bluetooth 2.1 + EDR technology

Wi-Fi + 3G model

- * UMTS/HSDPA (850, 1900, 2100 MHz)
- * GSM/EDGE (850, 900, 1800, 1900 MHz)
- * Data only2
- * Wi-Fi (802.11a/b/g/n)
- * Bluetooth 2.1 + EDR technology

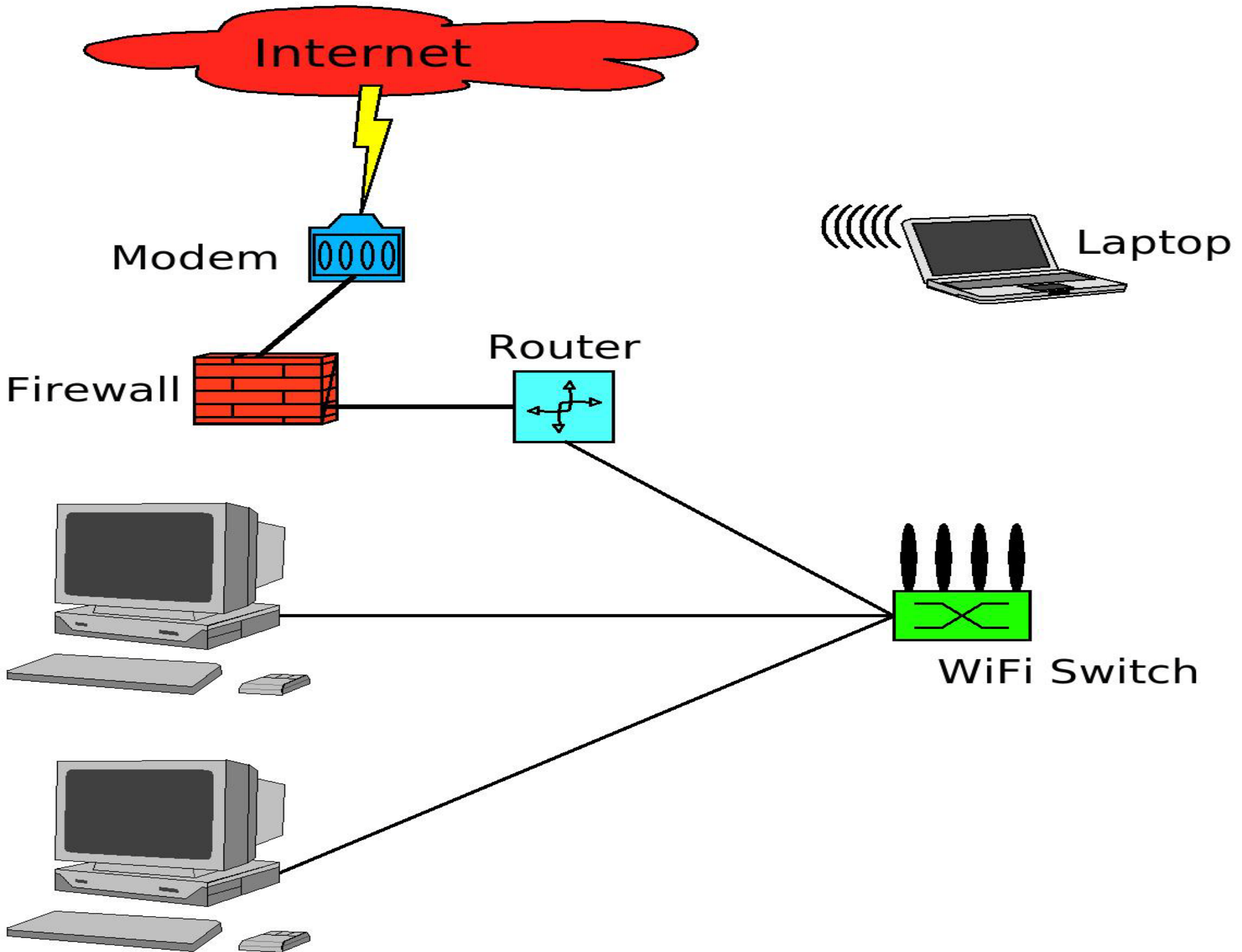
Wireless Bridge

- Simple adds device to network
 - Shares a network
 - Extends the switch
 - Does not segment network



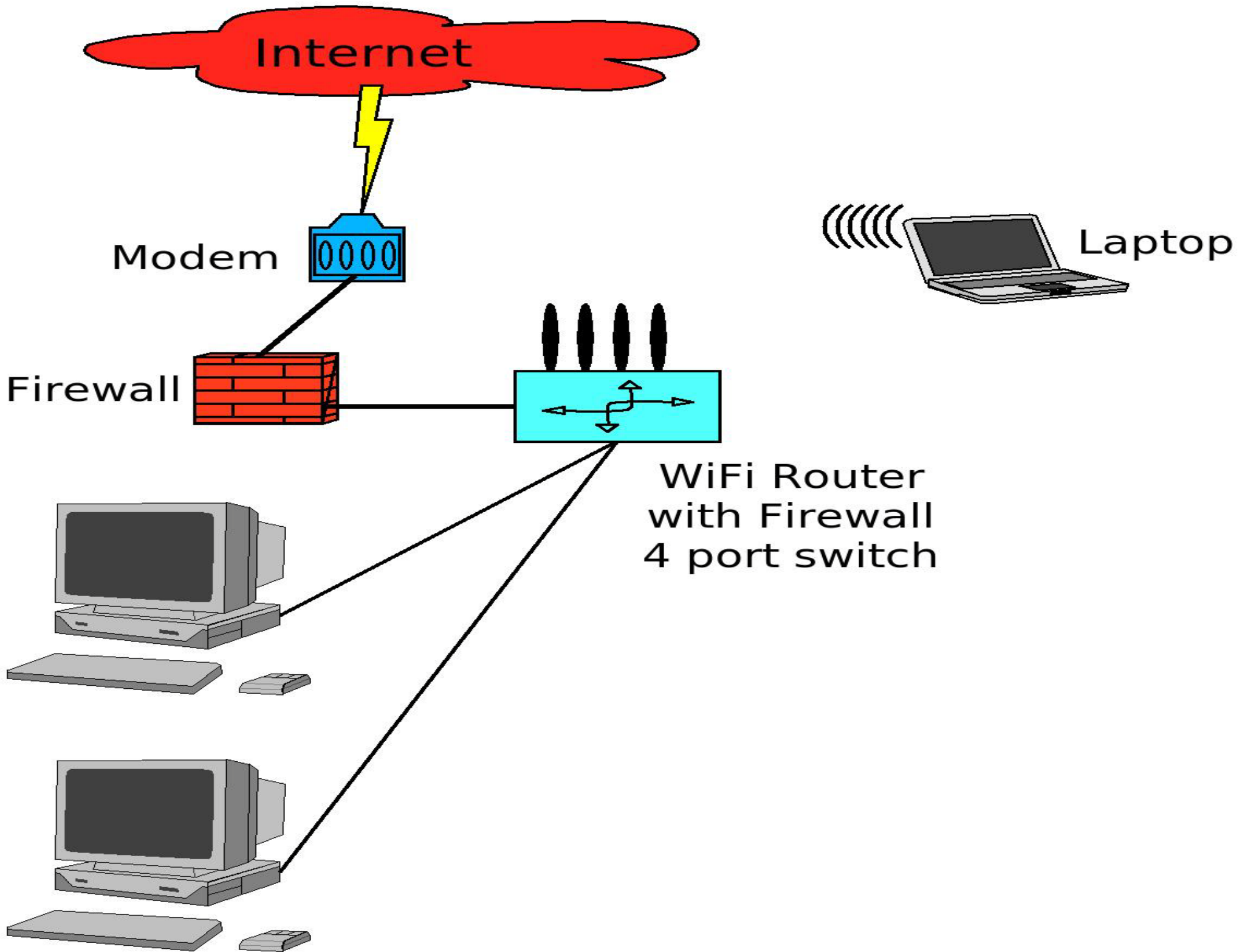
Wireless Switch

- Adds devices to network
 - Pretends to be a network
 - Will act as another switch
 - Ethernet Ports for devices
 - IP addresses



Wireless Router

- Adds devices to network
 - Can act as a switch
 - Ethernet Ports for devices
 - Routes between different networks
 - Probably has firewall
 - Probably has Internet



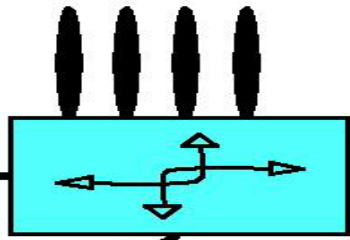
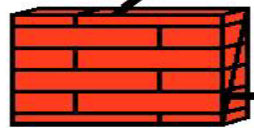
Internet

Modem

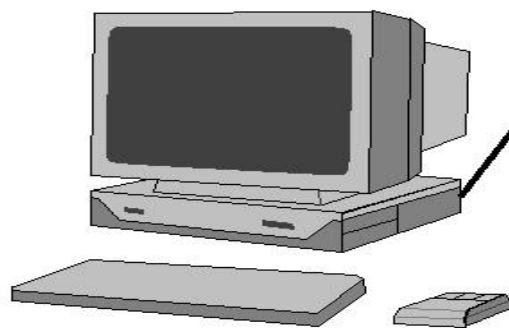
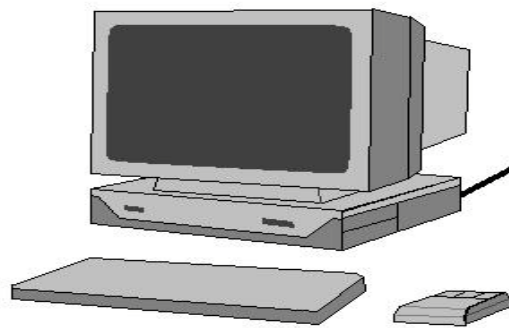


Laptop

Firewall



WiFi Router
with Firewall
4 port switch



Which to use

- I haven't seen your network
- New install / small office
 - Can use wireless router
- Existing network
 - Just add on
 - Switch or Bridge

Security

Things to do ...

Must use a Firewall

Hide your SSID ??

Filter MAC's ??

Who is Sid ? (SSID)

Service Set Identifier

AOA-Staff

AOA-Visitor

Exhibitor Internet 2

<unknown>

<unknown>

Hide your SSID ?

Service Set Identifier

My_Office_network = SSID

^ hide SSID

<unknown>

Device must enter My_Office_network

Wi-Fi

Wi-Fi Profiles

Current Profile

Secure

Selected Profile

Secure

Network Name (SSID)

My_Office_Network

802.11 Mode

802.11n

 WMM (Wi-Fi Multimedia)

WMM is mandatory if using 802.11n

Channel

Auto

Security

WPA2 Personal/PSK (AES)

Authentication

Open Access

Network Key

Not_Something_Simple

8 ~ 63 ASCII characters

For greater security, use a mixture of digits, upper case, lower case, and other symbols

Change your password

1234 12345 **123456** abc123

abcd1234

password iloveyou princess

rockyou

Nicole Daniel Michael Ashley

Babygirl monkey lovely

qwerty

A word about Passwords

0st3Qp@th1c

“zero” st 3 “Cap Q” p @ th “one” c

Alpha (Upper & Lower) / Numeric / special chars.

And remember it !

Does MAC know SID ?

Media Access Control
(Physical Hardware address)

my laptop is 8C:A9:82:B9:A2:7E

You can filter connections based on MAC

* sometimes you must turn off auto connect

LAN

TCP/IP

IP Address

Subnet Mask

MAC Address 00:15:FF:0F:D1:36

DHCP Address Range 192.168.1.2 ~ 192.168.1.10

Connected Devices

IP Address	IP Type	Hostname	MAC Address	Date/Time
192.168.1.4	DHCP	PSAVELYYIMB	C4:17:FE:48:CC:CB	11/01/2011 09:46:36am
192.168.1.3	DHCP	LENOVO-F53E4CBF	00:16:CF:1D:D1:85	11/01/2011 11:25:48am
192.168.1.2	DHCP	defiant	8C:A9:82:B9:A2:7E	11/01/2011 09:19:18am



MAC Filter

- Password
- MAC Filter**
- Port Filtering

Enable MAC Filter

Enable MAC Filter

If enabled, only Trusted Clients can connect to this Access Point. Trusted clients are identified by their MAC address.

Trusted Client List

Empty list box for trusted clients

Delete Client

Add Trusted Client MAC Address

Input field for MAC address

Add Client

Office Visitor SSID ?

* Only if you have the resources

Separate from your network

Still use a password

You must have the bandwidth

(limit bandwidth)

HIPAA Transmission Security

- In simplest terms, a **covered entity** must safeguard its electronic networks to ensure the availability and integrity of its electronic protected health information
- With open networks, such as the Internet, it is especially important to harden existing systems with **up-to-date** security software applications, firewalls, and intrusion detection systems

<http://www.hipaa.com/2009/07/transmission-security-what-this-hipaa-security-rule-technical-safeguard-standard-means/>

Encryption

- 128-bit AES , 64-bit WEP , WPA-Enterprise , **WPA-PSK** , WPA2-Enterprise , WPA2-PSK
 - Wi-Fi Protected Access
- WPA utilizes 128-bit encryption keys and dynamic session keys
- Either use TKIP or AES for encryption. Not all WPA hardware supports AES
 - Temporal Key Integrity Protocol
 - Advanced Encryption Standard

Wireless Access Point (WAP) features

- Quality of Service ?
- Access Control
- Rouge Access Point Detection
- MAC address control
- Port configuration
- Firewall
- Encryption
- Administration

Wireless Access Point (WAP) capacity

- How many **concurrent** devices ?
- How many channels (14 possible)
- How fast is the **Ethernet** connection
 - **10 MB or 100 MB or 1 GB**
 - Weakest link (320 MB throughput)
- How strong is signal strength
- Talks to other WAP's

Wireless Access Point (WAP) Admin

Local or individual admin at each WAP

Server based or remote admin for all WAP's

Wireless Access Point (WAP) Interference

- How high is your floor
- Microwave
- Other devices in spectrum

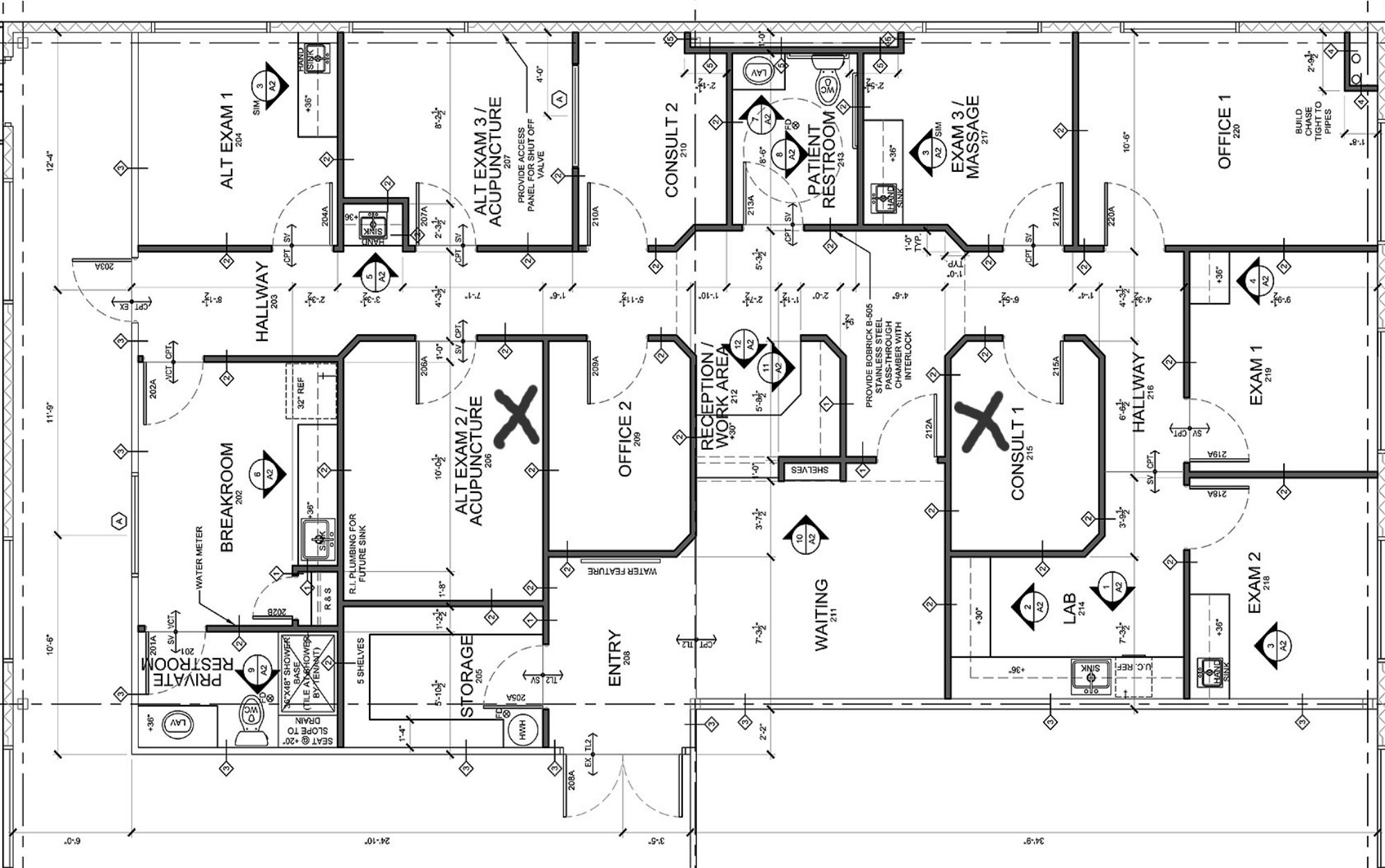
Wireless Access Point (WAP) location

- Interference generators
 - Motors, heat, coffee makers
- Walls and Ceilings
 - Metal, concrete
- Power generators
- Distance
- Redundancy or Fail-over

Expect a failure

- 2 units running at same time
- Doubles available bandwidth
- 1 unit will fail sooner or later
- Hopefully no down time

<http://evstudio.info/advice-for-medical-office-floor-plan-design-in-tenant-buildings/>



Life cycle Support

Half life is 4 or 5 yrs = 50 % failure
Full life is 8 – 12 yrs = unsupported
* and outdated

Avoid the 2 step

- You know what you're doing, go get me something that works
- IT Guys comes back with equipment

Do the 7 steps

- Find a reputable IT guy
- Describe your needs and plans
- IT guy does the math
- IT guy proposes equipment list & price
- You review list & ask why
- Purchase equipment & Install
- Config & Test the network !!!! (real world)

Wireless Access Point (WAP) models

- Home models
 - D-Link, Cisco, 3com, Netgear
 - \$100 - \$200 each
- Small Business models
 - Cisco, D-Link, HP
 - \$300 - \$600 each (AOA \$400 ea.)
- Enterprise models
 - \$500 - \$1,200 each

Summary

- Wi-Fi – 802.11n (turn others off)
- SMB unit (\$400)
- 2 per floor / 1 spare
- Look for Bridge / Switch model
- Use Encryption (WPA – TKIP / **AES**)
- 100 Mb or **1 Gb** Ethernet (LAN not WLAN)
- Plan for many devices (10 to 20)

Thank You

Questions ?