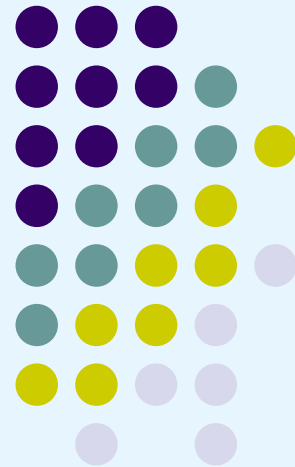


The Wireless Library

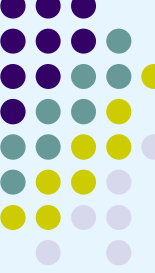
Technical and Organisational Aspects

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The Change in Raw Materials



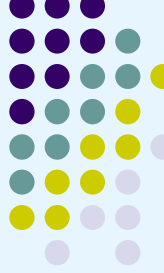
- Digital libraries – more than just OPAC
- Digital data: books, journals, databases, multimedia documents, content management systems
 - It is getting more every day
- Information is stored not solely in the library but also somewhere on Internet attached servers
- Users (still?) go to the library to merge “old” paper material with new digital material and want to get their work done in one place.
 - By printing it out? How do you print “sound”?
 - By storing it on a CD/floppy disk? Where?
 - By doing Internet searches at home?

Change in User Expectations



- The new user – fully equipped
 - Laptop computers
 - Personal Digital Assistants
 - Digital cameras
 - Mobile Phones with powerful features
 - Mobile scanners
 - Mobile printers
 - Mobile storage
- Less than 5kg total weight!
 - Books are heavier!
- The new user is not a computer science student
 - But comes from all faculties





Change in User Expectations

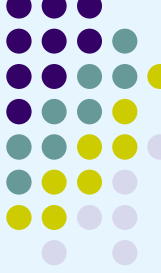
- Laptops need electricity to recharge the batteries
- Batteries are not standardized so we cannot offer generic recharging stations
- Bags can be left outside the library
- Computers must stay with their users
 - Even when they go to the toilet??
 - How to secure laptops?



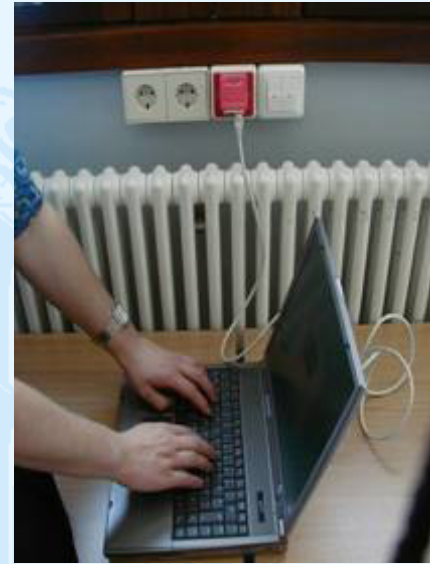
A Freiburg „invention“



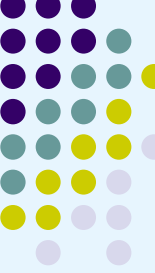
Change in User Expectations



- But where is the powerful network to link these things to the library contents?
 - Commercial networks (GPS, GPRS, UMTS) are slow and expensive, therefore unusable
- Users work where the information is
- Network sockets can be used by library users
 - Rewire the whole library?
 - Cables everywhere?

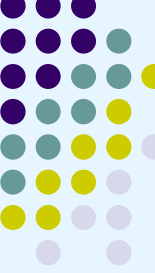


Wireless networks



- Fortunately technology helps us to get rid of cables:
Wireless IP networks WLAN (WiFi) based on IEEE 802.11b, 802.11g, 802.11a
- A bit of tech talk 😊
 - 11g is compatible with 11b
 - 11b/g: 2.4 GHz, max 0.1W (11a: 5GHz)
 - Mobile phones: up to 2W (900 MHz phones)
 - Max range: 300m (average best conditions)
 - In reality: 20m (concrete) to 10km (optimal antennas)
 - No rules for best location: educated guesses!
 - For larger distances: 11b = 11g
 - Today (03/2004) 11g is not yet rock solid, 11b already is.
 - 11b: 11 Mbit/s 11g: 54 Mbit/s 11a: 54 Mbit/s
 - Most user devices speak 802.11b/g,
 - Modern notebooks speak a/b/g
 - Advice: Install a wireless network today!
 - Use 11b today and 11g from 05/2004 onwards in frequented areas
 - Professional wireless network access points cost less than €300,--
 - Professional = remote management possible

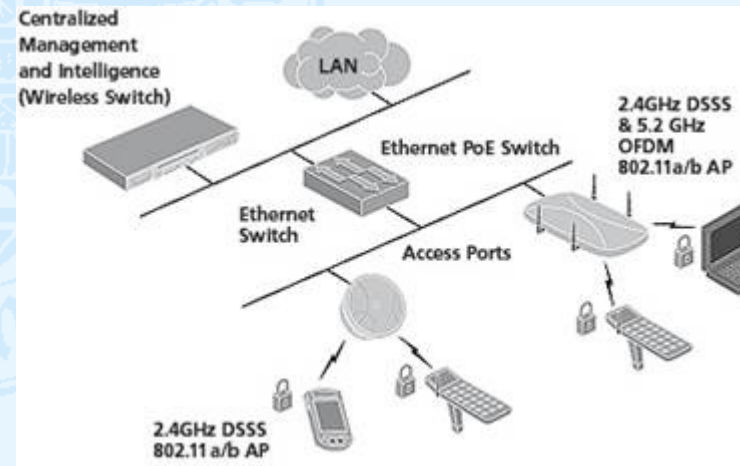
Wireless networks



- A few facts:
 - Wireless networks are no replacement for a good cable infrastructure
 - But: don't wait 5 years for your cables – use a wireless alternative today!
 - Wireless networks rely on a good cable infrastructure to carry the traffic from the access points
 - Wireless networks are shared networks
 - The individual throughput depends on the number of users in one cell (like UMTS)
 - Maximum of 256 users in one cell
 - Not more than 4 overlapping cells
 - Wireless networks are a perfect extension to your existing network

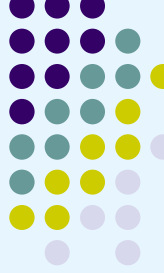
Access points

- Access points connect wireless laptops to your network
- Various solutions, highly standardized
 - Plug and play!!
- Latest development:
 - Logic is concentrated in a 19" box
 - Antennas are connected by TP cables
 - Ideal for management



Antennas

(not all are suited for a library...)



**6 dBi Patch
DIR-060-01**



**5.2 dBi Omni (outdoor)
OMN-052-02**

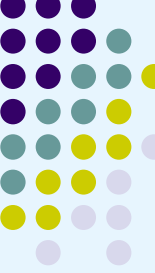


**13.5 dBi Yagi
DIR-135-01**



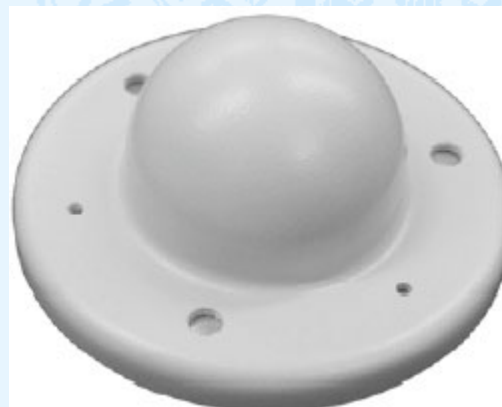
**12 dBi Omni
OMN-120-01**

**21 dBi Solid Dis
DIR-210-01**



Hidden Antennas

- There are design antennas almost invisible to users and architects:



Bluetooth LAN Access

- WLAN is not the only wireless solution
- Bluetooth:
 - Widespread solution for small devices
 - Phones, PDAs
 - Very little power consumption
 - 0.01W – range 10m
 - Also 2.4 GHz range
 - Coexists with WLAN!
 - „slow“: 1 Mbit/s max
 - LAN access profile
 - Works like WLAN
- €69,-- per Access Point

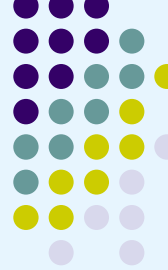


Infrared LAN Access

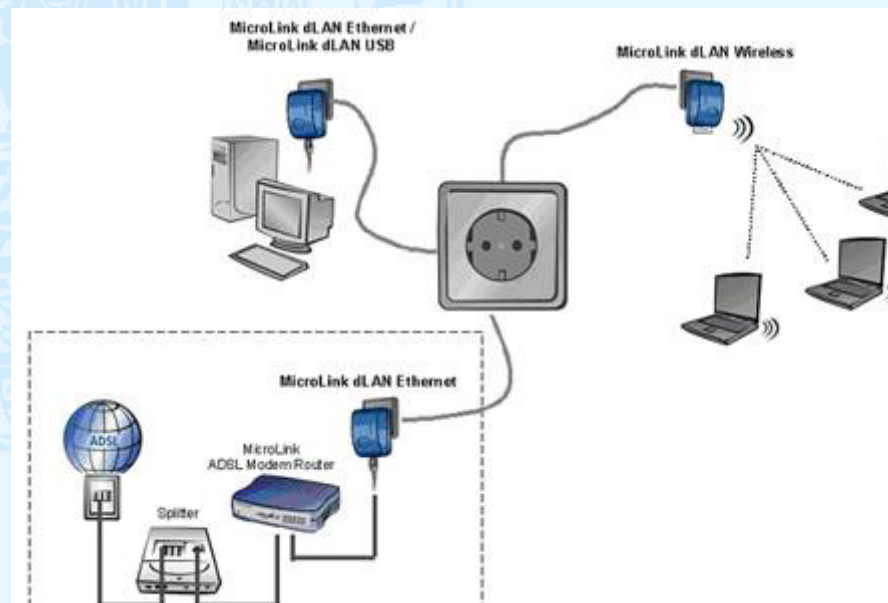
- Light can also be used to carry IP traffic
 - Most laptops, PDAs, phones, etc have an infrared port...
 - ... and most operating systems provide drivers for „IP over infrared“
 - Direct sight contact required
 - This can be useful (security...)
 - Range 2m, max 4 Mbit/s
 - best used for „brief contacts“
 - Mail download, conference program
- LAN Access points are now available
 - Plug and play
 - €85,--



Powerline an alternative to wiring a building?

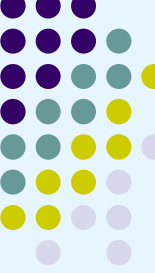


- What if
 - There is no network?
 - I can't believe this ☺
 - The network does not reach an adjacent room?
 - And wireless can't penetrate the walls/floors?
- Send the data over the electrical wires!
 - 14 Mbit/s shared
 - Does not work across segments
 - Susceptible to inference from any appliance
 - Reasonably reliable
- Ideal to bridge the time till proper cabling is installed
 - Plug and play
 - €80 per adapter
 - Wireless to powerline adapters available

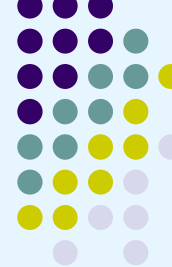


Technical summary

- Users want Internet access – and users are customers!!
- Wireless networks match user needs
- Wireless networks can be deployed rapidly
 - Less than one day for a first setup
 - So do it – and do it now! Your users will love you
- Provide a variety of technologies
 - *WLAN 802.11b/g* to cover the area (primary solution)
 - *Bluetooth* LAN access in interesting spots
 - Reading rooms, cubicles, lecture rooms, cafeteria
 - Additional coverage, not XOR to wlan!!
 - *Infrared* LAN access in selected places
 - Reception desk, a few cubicles, infopoints
 - *Network sockets* for users where appropriate
 - *Powerline* to quickly connect otherwise unreachable areas
- Total cost of hardware for a library: probably less than €5000 for a satisfactory initial setup

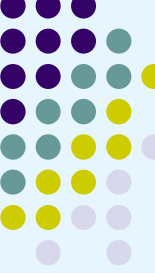


Organisational issues



- There are lots of discussions about security
 - What security? Protect against whom?
 - These discussions confuse the non-expert
- Many universities operate wireless networks in a totally secure way! *How?*
- Keep the wireless network and the required infrastructure completely separated from your LAN
 - You don't need new cables – use VLAN technology in your switches!
 - Assign a new network to some switch ports which is not connected to your existing network
 - Just a bit of configuration work in the software
 - Easy job for a system administrator
 - Connect the new network to your Internet gateway
 - Thus traffic from the (wireless) user network is considered external and therefore “hostile”
 - Wireless users get the same privileges as any other Internet user

Organisational issues



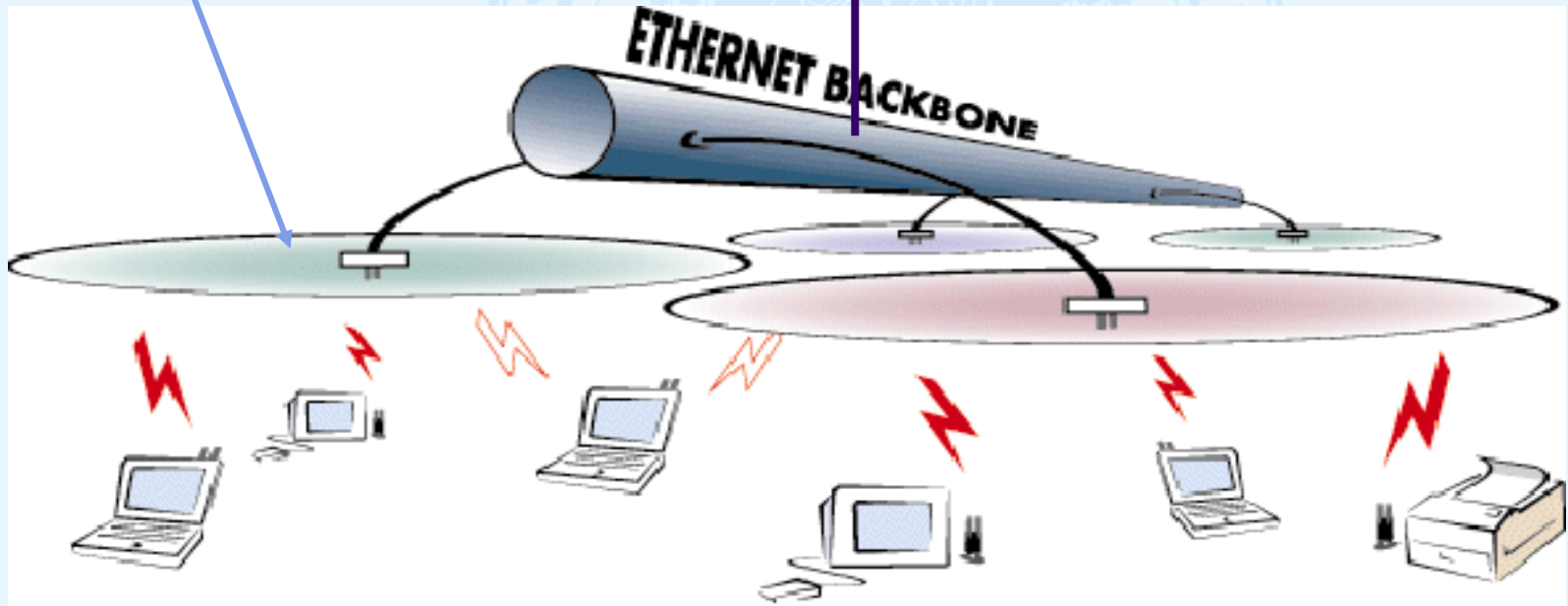
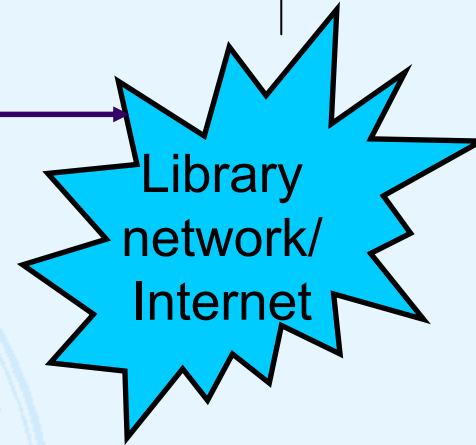
- Make sure that all devices for user access
 - WLAN, Bluetooth, Infrared, sockets, powerline are in one transparent subnet and that only IP LAN access is provided (thus you provide „roaming“)
 - Do not mix „IP for WLAN“, „serial for infrared“, „dialup for bluetooth“ – or you will confuse everybody, especially your sysadmin
- Offer DHCP on this network
- Do not try to set up a „special environment“ to please your sysadmin or your director
- Do not worry about user security
 - This is a user problem, not yours
 - Your security is guaranteed if you do not connect the user network to your (internal) network, as suggested above
- Do not control user access to this network

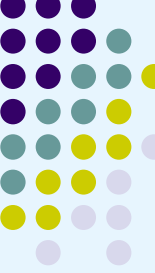
Mode of operation

Shared 11/54 Mbit/s



Gateway

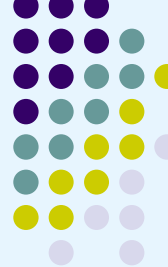




Uncontrolled access?

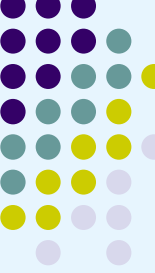
- Do I really mean this?
 - Free surfing? Even from across the road?
- You may implement access control on the gateway
 - Just like many internet cafes or hotspots
 - Standard software solution available from AP manufacturers
 - Issue day tickets, weekly tickets, hourly tickets “over the counter”
- Typical scenario:
 - Users access the network without problems
 - As soon as they start their browser they are automatically directed to the access control server on the gateway
 - There they enter userid/passwd from the ticket
 - When the rights expire the access control server cuts the connection to the Internet
 - A working, commercially solid solution
 - So why worry?

Controlled access



- University libraries:
 - Do not run your own network, but connect your network to the university wireless network
 - Thus use their access control for university members
 - Operate your „hotspot technology gateway“ for external users only
 - This saves you some work 😊
- Management has to decide whether to charge for access to the user network or whether to provide free access to registered users
 - Don't run logfiles unless your are forced to do so by law
 - Sysadmins tend to collect too much data
 - Payphones do not require id cards for operation – why should we identify users?

Security issues



- Users must ensure their own security
 - By using encryption – most mail systems require SSL connections these days, so reading mail is safe on wireless networks
 - Most users will be used to using encrypted tunnels to their home institution
 - As this is the standard setup in many university wireless networks – IPsec tunnels
 - Also used by home users to „get“ a university IP address – useful for IP address controlled database licences
- So set up an IPsec gateway („secure dial-in“) for your library staff
 - IPsec is rock solid security offered by standard software
 - Via IPsec tunnels your staff can securely use the user wireless network
 - Adjust your workflow to the fact that your staff is now mobile!!



Organisational summary

- Separate the user network from your internal network
- Use access control at the gateway only
 - Software solutions are available
- Separate security issues from network operation issues
 - Use tunnel technology to encrypt any traffic
 - Do not worry about user security
- Use the network for your staff to improve your workflow
- „early bird“ libraries offering wireless networks:
 - SUB Göttingen (since late 2000)
 - UB Freiburg (since early 2002)

