Wireless + education =? Bluetooth from an adopter's view-point

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Paper No. 6

DAY 1.
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Asian Media Information and Communication Centre
Second Regional Symposium on
New Media and Learning Technologies

Wireless + Education = ?

Bluetooth from an adopter's view-point
September 1999

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Agenda

- Motivations
- Wireless technologies
- About Bluetooth
- Challenges for wireless in education
- About diffused infrared

Motivations - push factors

- School bags are too heavy!
- Desk-top computers are not suitable for conventional classrooms
  - Too big to fit 40 in a typical classroom; need customisation of classrooms
  - Too many cables; cannot avoid having cables on the ground or having raised floor
  - Lost of eye contacts; teachers can only see monitors!
- Notebooks are miniaturised desk-top computers
  - Still need a desk or a 'lap' to work
  - Cramped keyboard layout
  - Expensive - meant for travelling professionals

Motivations - pull factors

- Enable learning anywhere, anytime
- There must be better ways for computers to help learning ...
  - ... besides Microsoft Word (input)
  - ... besides Microsoft Power-Point (output)
  - ... **what happen to feed-forward/feed-back during classes ??**
- Why not KISSes for kids? (Keep-It-Small & Smart, Keep-It-Small & Simple, Keep-It-Small & Stupid, Keep-It-Simple & Smart)

How to improve?

•Push factors:
- •Guidelines to lighten schoolbags
- •Standardise school bag size, with wheel
- •lockers to keep textbook
- •Share books, tear books into half

•Pull factors
- •Encourage team work in class
- •Field trips
- •Integrate Internet into teaching
- •Stimulate creativity through set-piece problems

•Opportunity: Replace the books with "something":
- •Smaller than a computer
- •Weigh much less
- •Carry much more....

•Opportunity: reduce burden with "something" for ...
- •Conducting activities
- •Interacting with class
- •Interacting with peers
- •Being simply connected ...

Enablers ...

- What should "something" be?
  - A device that one can hold on one hand and write naturally,
    - ... *like writing on a paper; "just write", no need to save, "once inked it is there"*
    - ... free form; can mix writing and drawing
    - Example: **eduPAD**
  - A device that can facilitate interaction
    - ... interact with teachers
    - ... interact with peers
    - ..... In proximity or via Internet
    - **Wireless technology** is essential; topic of today's presentation

Wireless Technology

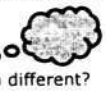
- Digital **cellular** wireless technology
  - Evolution
    - **Second generation (2G)** cellular wireless technology; GSM / GSM1800 / CDMAone (9.6Kbps to 14.4 Kbps)
    - **2.5G** cellular wireless technology; GPRS - packet wireless data (144Kbps), HSCSD - circuit mode wireless data (9.6Kbps to 64Kbps)
    - **3G** or UMTS or commonly known as W-CDMA; 384Kbps to 2 Mbps
  - Characterised by "shared" usage of resources ; not everyone makes a call at the same time at the same geographical area.

Wireless Technology

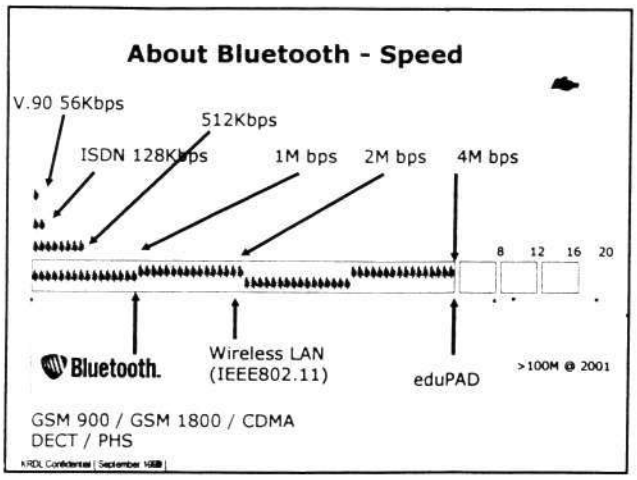
- Digital **cordless** wireless technology
  - Evolution
    - First generation cordless wireless technology; the cordless phone most have at home
    - **CT2** cordless wireless technology
    - **PHS** - Personal Handy-phone, popular in Japan, has 32Kbps wireless data capability
    - **DECT** - Digital Enhanced Cordless technology ; support 32 Kbps to 552Kbps wireless data
    - **Bluetooth** - Support wireless data up to 721Kbps
  - Characterised by "low-cost short-range low-power" usage of resources ; not everyone need to have high-end handset.

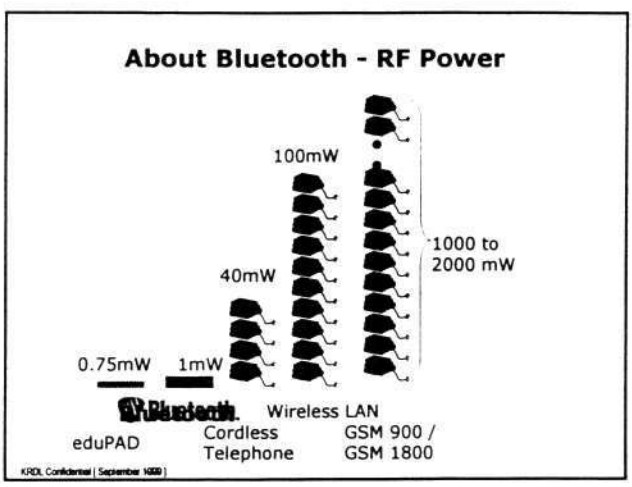
Wireless Technology

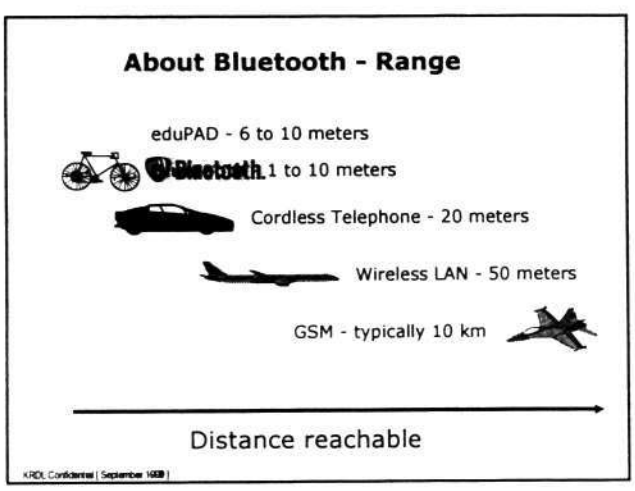
- Digital **cellular** wireless technology
  - Long range because of high radio emission power (typically 10km, max 35km @ 2W for GSM900)
- Digital **cordless** wireless technology
  - Very limited range because of low radio emission power; (typically 20 meters @ 10mW)
- Questions??



  - How is Bluetooth different?
  - Are there any wireless technology on the technology horizon?





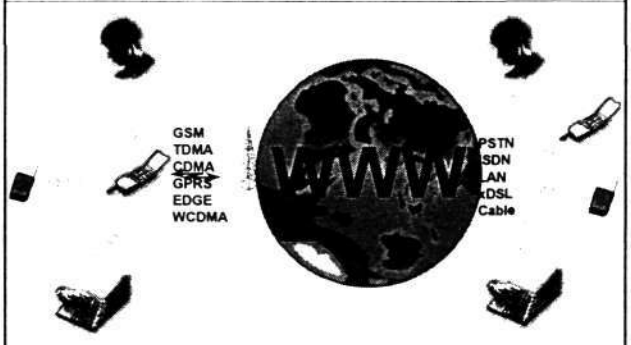


About Bluetooth - In a nut shell

- Therefore, Bluetooth is
  - A wireless technology **optimised** to deliver information bits at acceptable speed, range and power consumption
  - OR: none of the existing technology is perfect.
  - "Different carrot soup"
- Bluetooth is actually introduced as a "wire-replacement" ; or more precisely "wire eliminator"

Source: Bluetooth SIG

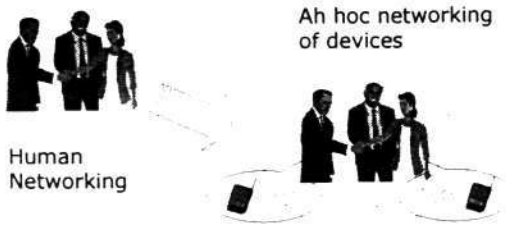
Bluetooth connects devices to Internet both on the fixed and mobile infrastructure world wide



Source: Bluetooth SIG

About Bluetooth - In a nut shell

- More importantly, it is introducing to the world a concept called ad hoc networking, or personal-area-network



About Bluetooth - What ??

- So, what implications does Bluetooth has to education:
  - Positive impact
    - Will enable new form of exchange of information at new level of conveniences
    - Will enable collaboration work by minimising logistics in organising
  - Negative impact
    - Bluetooth will enable a new generation of "Information Appliance"; small wireless devices
    - ...

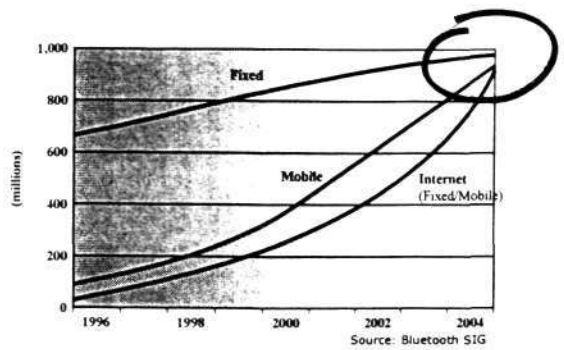
About Bluetooth - What ??

- So, what implications does Bluetooth has to education:
  - Positive impact
    - Will enable new form of exchange of information at new level of conveniences
    - Will enable collaboration work by minimising logistics in organising
  - Negative impact
    - Bluetooth will enable a new generation of "Information Appliance"; small wireless devices
    - Perfect for 'cheating' ;-)

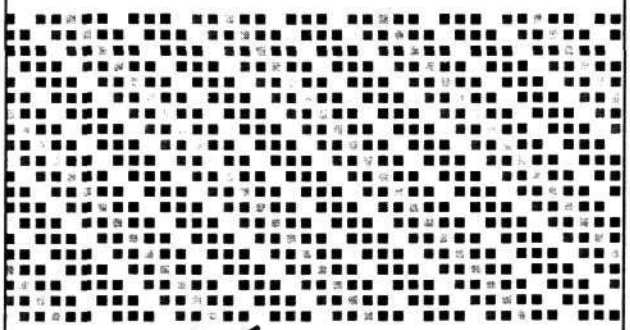
About Bluetooth - When ?

- Specifications 1.0 has been released on July 28, 1999
- Some companies has demonstrated prototype during Bluetooth meeting at London in June
- It is expected that many Bluetooth enabled devices will be available to consumer by end of 2000
- Why the excitements ?

Subscribers



The Bluetooth SIG



More than ~~800~~ 1036 members! Source: Bluetooth SIG

About Bluetooth - At KRDL ...

- At KRDL ...
  - We are developing Bluetooth protocols
  - We are using Bluetooth to enhance our future versions of eduPAD
  - We are looking into how we can use ad hoc networking technologies in collaborative learning
  - We are also looking into how Bluetooth can allow the school to interact with the home
- We want to enable new platforms for collaborative applications in schools and businesses

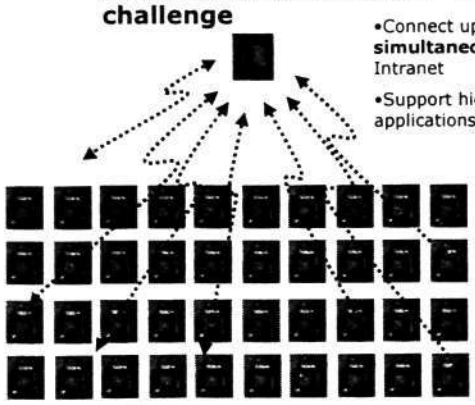
Challenges

- Education environments, such as classrooms, pose many challenges ...
  - Typically, very high user density within the same geographical area -
    - Implies tough interference and frequency planning problems
  - Subjected to 'reply' storms - traffic pattern are very 'clustered'
    - Implies that any wireless technology based on 'shared' access will have inherent problem addressing this issue; wireless LAN is not suitable
- Bluetooth is not engineered for such needs, neither is Wireless LAN

Challenges

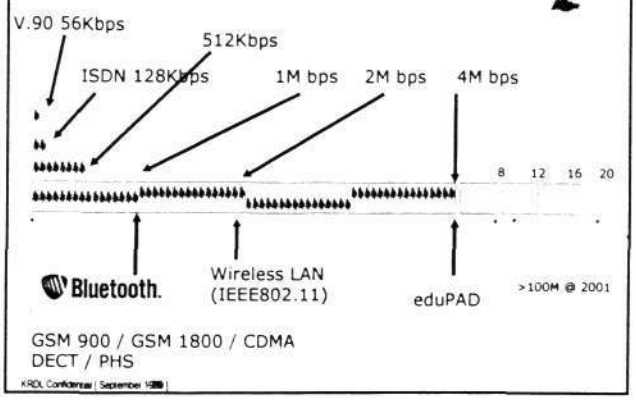
- Education contents are also media rich, such as, inclusion of short video clip (MPEG, typically 1.15Mbps)
  - Imply the need for 'guaranteed' high bit rate on the wireless link
- Bluetooth is not engineered for such needs, neither is Wireless LAN

About Diffused Infrared - The challenge



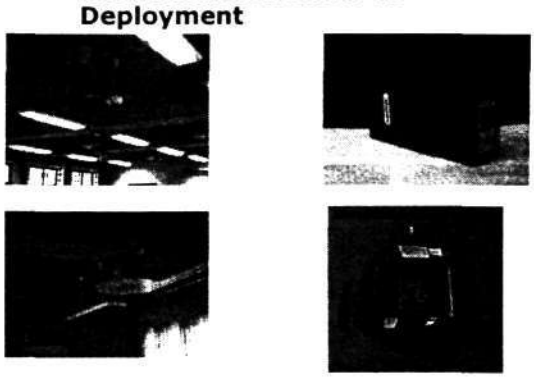
- Connect up **40** users **simultaneously** to the Intranet
- Support high bit rate applications

About diffuse infrared - Speed



GSM 900 / GSM 1800 / CDMA
DECT / PHS

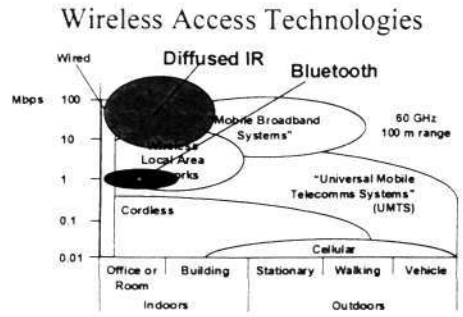
About diffused Infrared - Deployment



About diffuse infrared - What ?

- WHAT? It is a wireless link technology that has asymmetrical bandwidth on the up- and down-link portion of the wireless link
- Key advantage is ability to handle very high user density, at low cost, low power at mobile side.
- Use of optical wireless allow easy scaling of bit-rate

About diffuse infrared - What ?



"Why" these activities?

- Dis-continuity created by convergence of computer and telecommunication
  - Computer era : Human adapts to computer - 'technology push'
  - Appliance era : Computer adapts to human - 'User's need'
  - Therefore, appliance is NOT miniaturising what is on desk-top
- Dis-continuity created by broad-band into homes
  - Emergence of always ON network with decent bit rate

Wireless + Education = ?

- My guess
  - Real-time collaboration for learning

The End

- Thank you for your attention
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