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the
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international centre for theoretical physics

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SECOND ICTP - URSI - ITU/BDT SCHOOL ON THE USE OF RADIO FOR DIGITAL COMMUNICATIONS IN DEVELOPING COUNTRIES, INCLUDING SPECTRUM MANAGEMENT

(1 - 19 February, 1999)

Introduction to Radio

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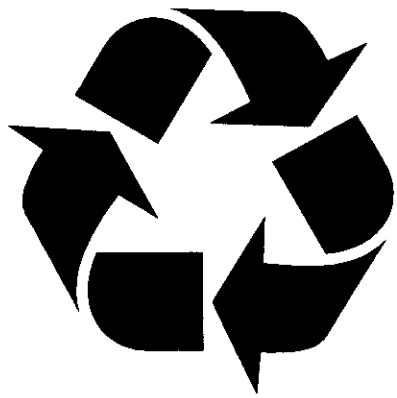
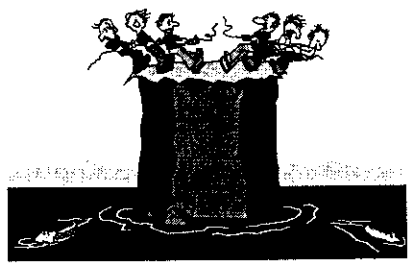
Why to go WIRELESS ?

- **Temporary Installation**
  - *Emergency Networks*
    - *Emergency Voice and Data Network*
  - *Disaster Recovery Networks*
    - *Backup of damaged wired Networks*
  - *Exhibitions*



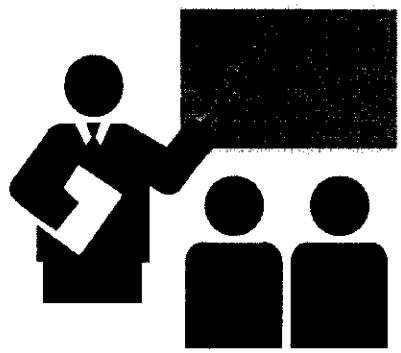
Why to go WIRELESS ?

- **Difficult Access Location**
  - *Historical Buildings*
  - *Remote Areas*
    - *Building to Building*
    - *Internet providers*
  - *Places Inaccessible by wire*
    - *Airport Light Beam*
    - *Harbor signaling systems*



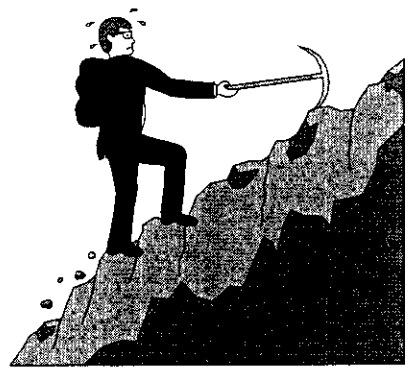
Why to go WIRELESS ?

- **Permanent Systems**
  - *Conference Rooms*
    - *Access to LAN resources, data, images, presentation*
  - *Fast Deployment*



Why to go WIRELESS ?

- **Mobile Users**
  - *University Libraries*
    - *Real Time book repositioning and checking*
  - *Hospitals*
    - *Bedside access to wired LAN info*
  - *Factory Plants*
    - *On line inventory*
  - *Telemetry and Remote Controls*
    - *Meteorological Stations*
    - *Hydrogeological measurements systems*

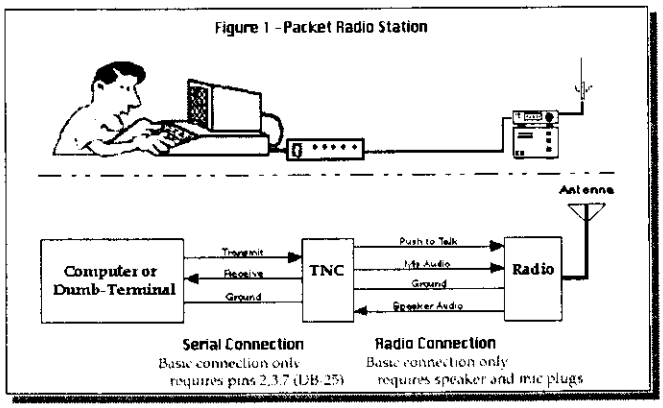


Wireless Technology

- *Types of WIRELESS*
  - ***Narrow Band***
    - *Packet Radio*
    - *Micro Wave Links*
  - ***Spread Spectrum***
    - *Direct Sequence Spread Spectrum*
    - *Frequency Hopping Spread Spectrum*
  - ***Infrared***

Narrow Band

- *Packet Radio Layout*

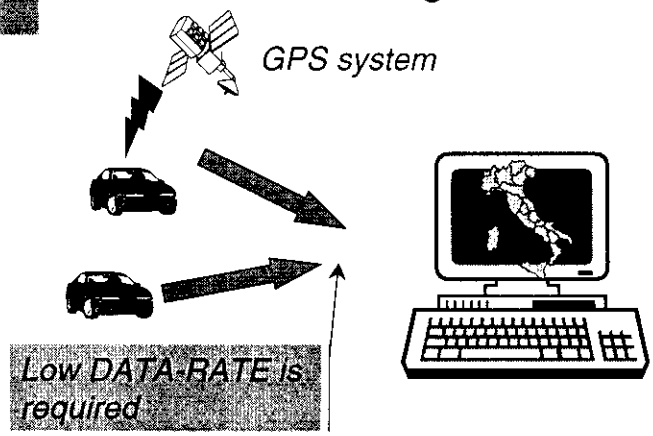


Packet Radio

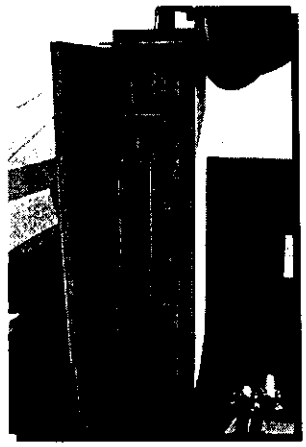
- *This technique, mainly developed by Radioamateurs, plays an important role in the LOW COST, data transmission systems.*
- *If you have a remote unit (i.e. meteorological stations) that do not require high speed connection, it is possible to link it using PACKET RADIO*
- *The average cost of a 9.6 Kbps system is not higher that 700 US$ per site, and can be even cheaper if the speed is reduced to 1200 bps.*
- *In general this technology is well suited for DATA ACQUISITION, VEHICLE POSITIONING (attached to a GPS unit), REMOTE CONTROLS.*

Packet Radio

- *Vehicle Positioning with GPS:*



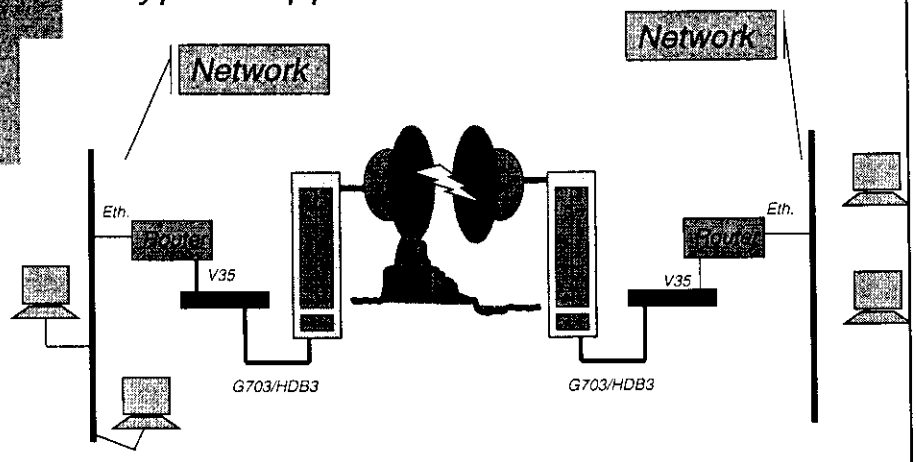
Narrow Band



- *10 GHz μ-wave digital link*
- *2 Mbps Speed*
- *G703 Line Interface*
- *Cost: greater than 30.000 US$ per unit*

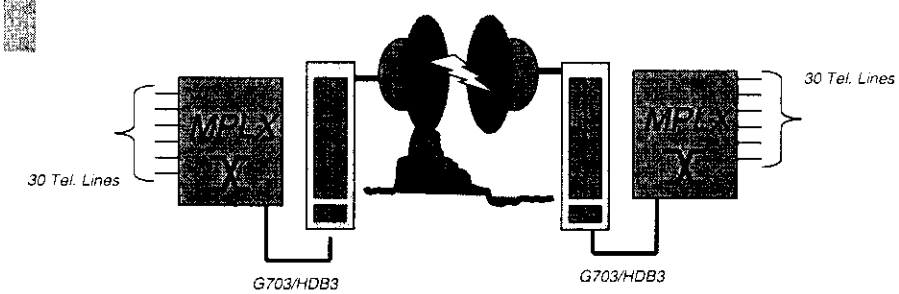
Narrow Band

- *Typical Application Scheme*

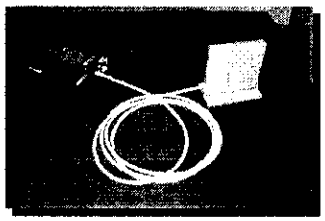


Narrow Band

- Alternative Solution



Spread Spectrum



- 900 MHz Spread Spectrum (DS)
  - 2 Mbps (Theor.)

1

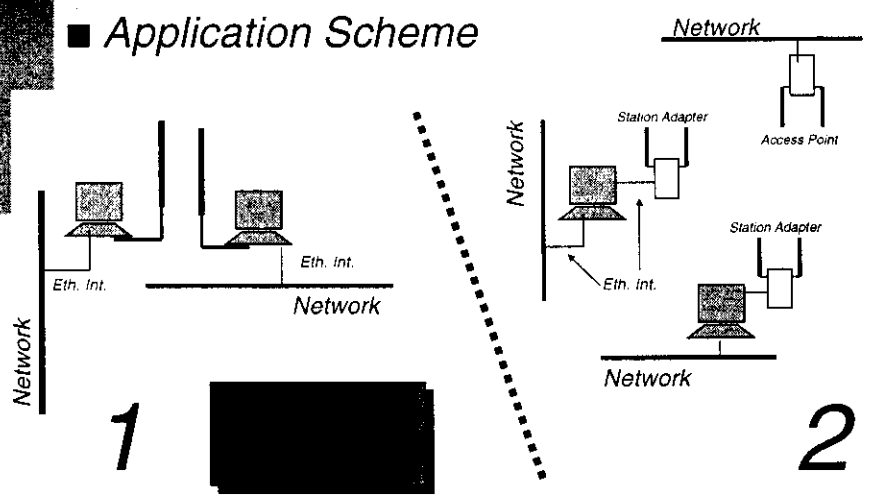
Cost: can vary from 700 US$ to 3500 US$ per unit.

- 2.4 GHz Spread Spectrum (FH)
  - 3 Mbps (Theor.)

2

Spread Spectrum

- Application Scheme



Introduction to radio equipment

The end. Relax