New Issues in Wireless and Mobile Networks

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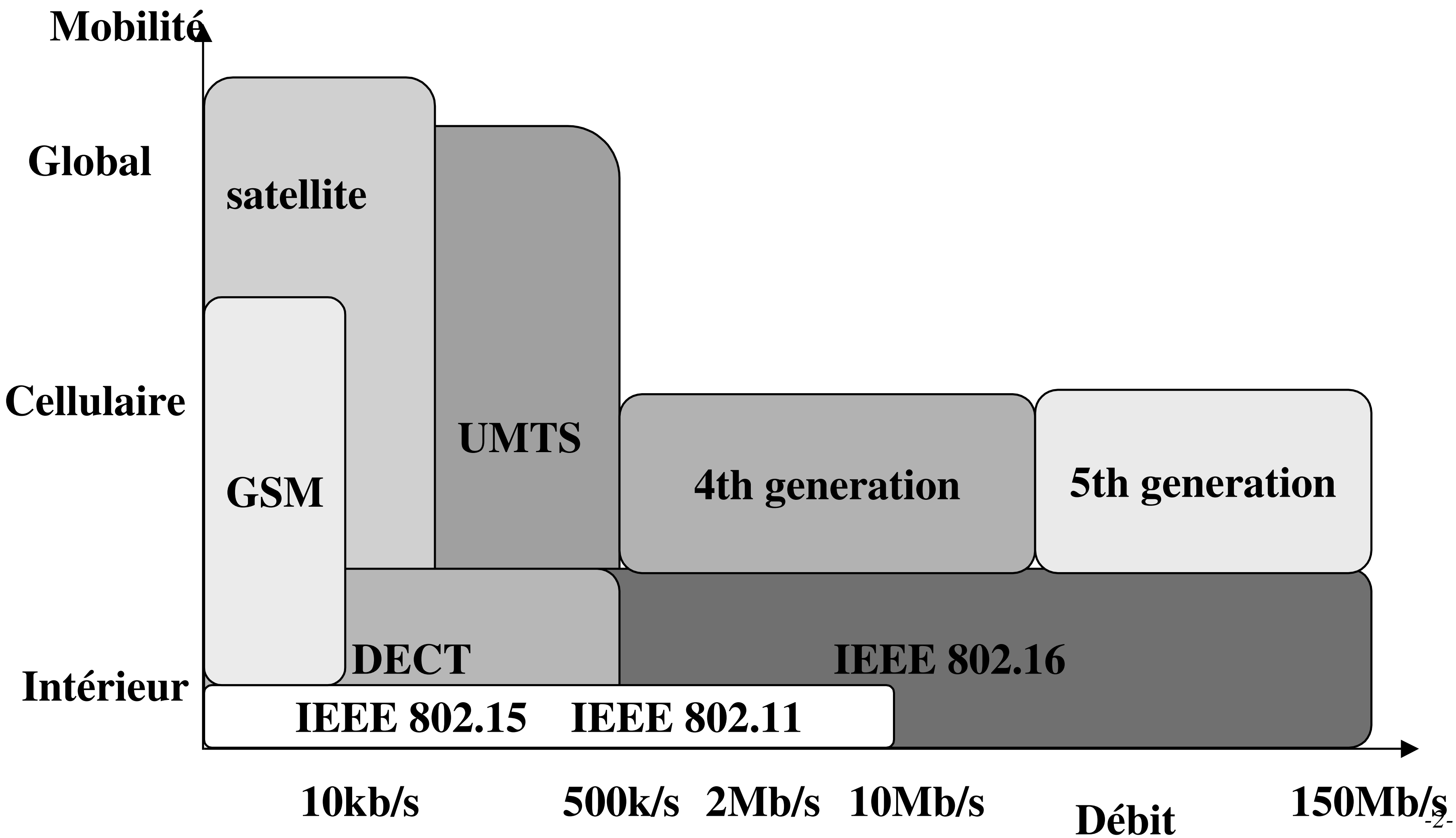
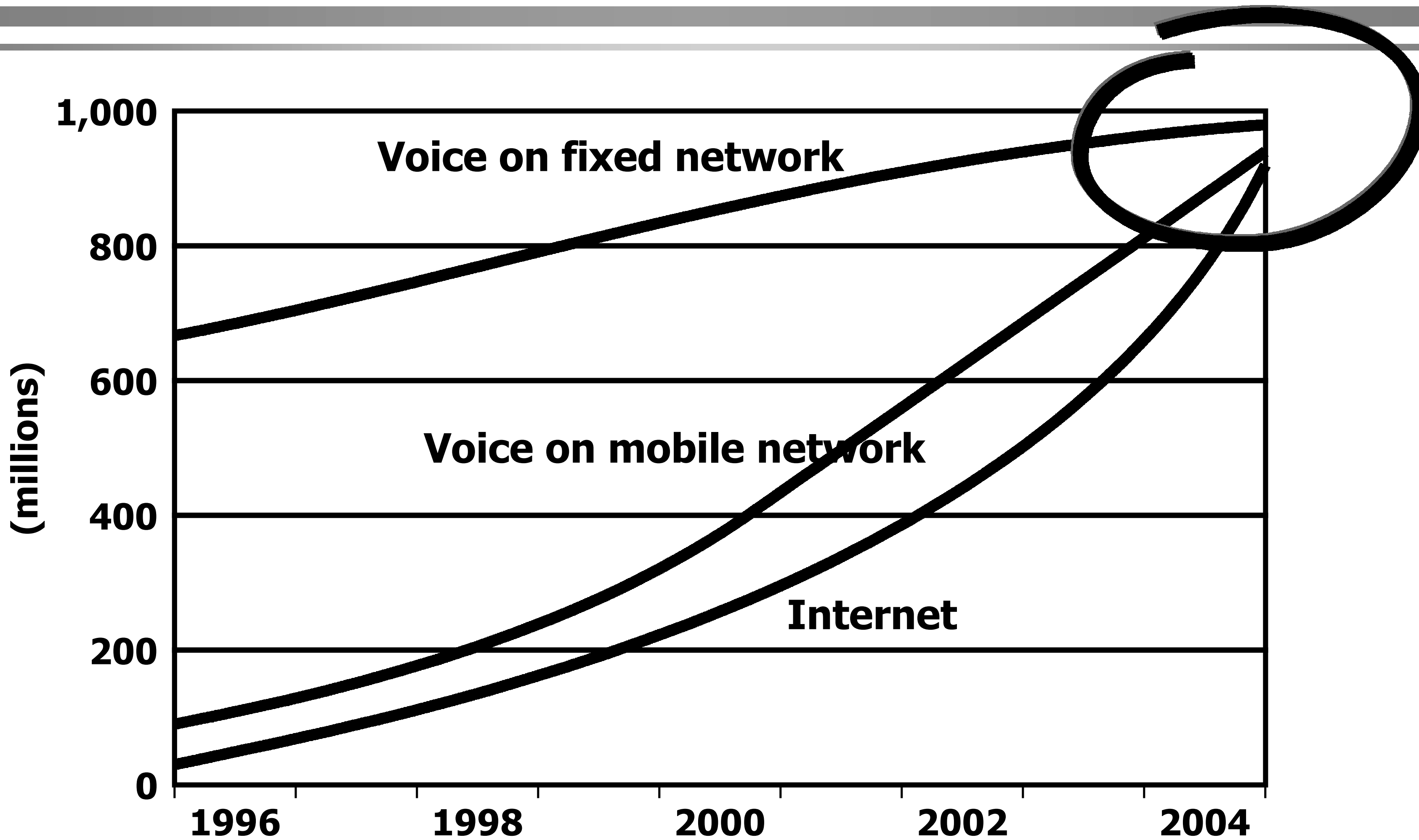
Mobility and throughput



Convergence



Convergence of applications

Fixed Internet

Mobile Internet

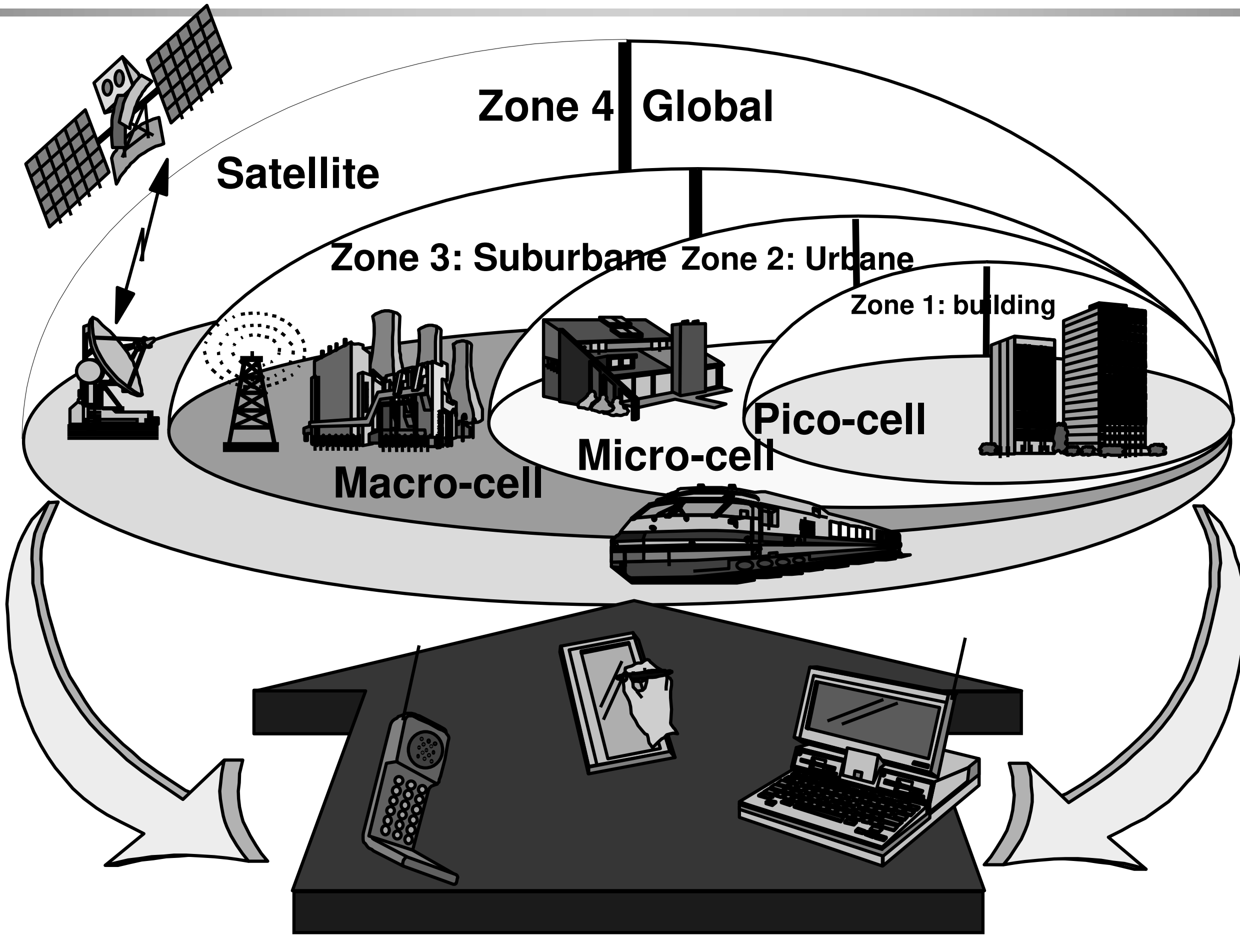
High-throughput application

Same applications
Same control scheme
Same management

Always available

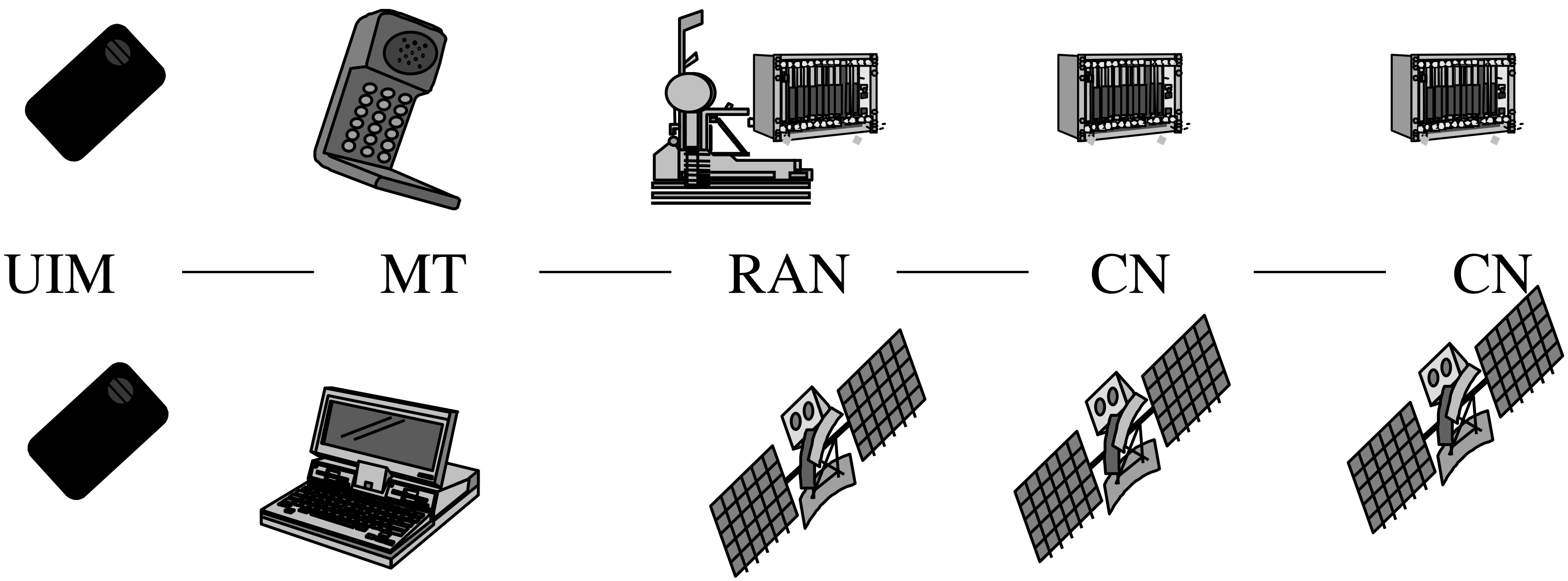
Mobile networks

IMT-2000



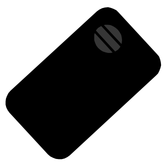
International Mobile Communications for the year 2000

Interfaces

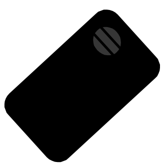


- ✓**UIM: User Identity Module**
- ✓**MT: Mobile Terminal**
- ✓**RAN: Radio Access Network**
- ✓**CN: Core Network**

UIM-MT interface



UIM —— MT

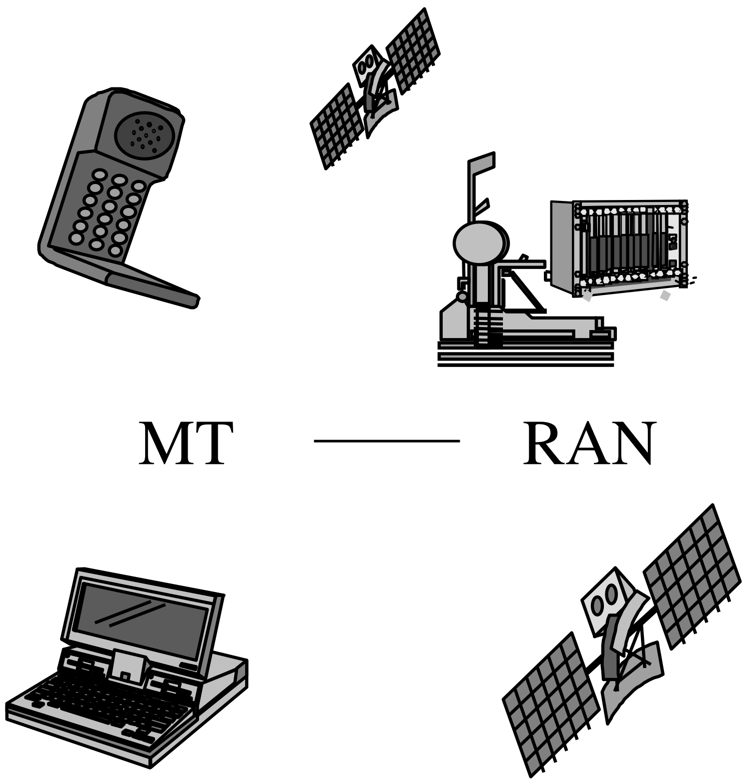


UIM: User Identity Module

MT: Mobile Terminal

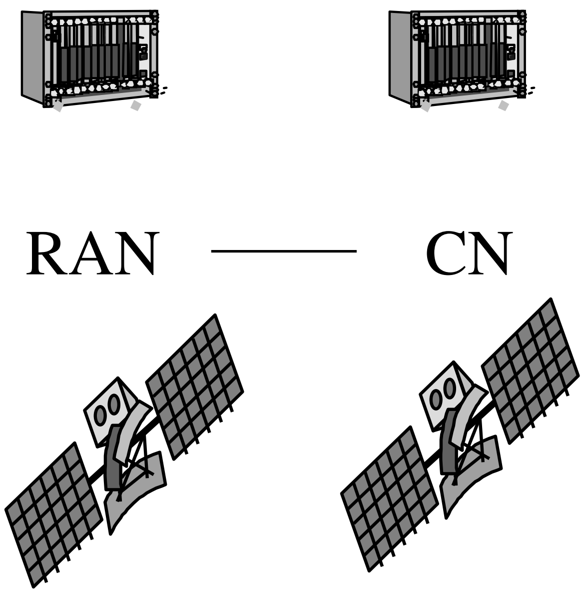
- **Access control**
- **Smart card**
  - **100 MHz and 1 Mo**
  - **intelligence of the access control**
  - **Operating system**
  - **VHE (Virtual Home Environment)**
- **Stack of protocols**
  - **ATM**
  - **IP**
  - **MPLS**
- **Awareness agent**
- **Security**

Air interface



- **Several interfaces within IMT-2000**
- **2$_{sg}$ generation: digital circuit**
  - **GSM: TDMA**
  - **IS95: CDMA**
  - **IS136 : TDMA**
- **2,5$_{sg}$ generation: digital circuit + packet**
  - **GPRS**
  - **GP IS136**
- **3è génération: digital + packet**
  - **UMTS (Europe) ------------> UMTS**
  - **W-CDMA (japon) -----------> UMTS**
  - **CDMA 2000 (USA)**
  - **EDGE (GPRS +GP IS136 + x)**
- **Political, economical and technical issues**

RAN-CN interface



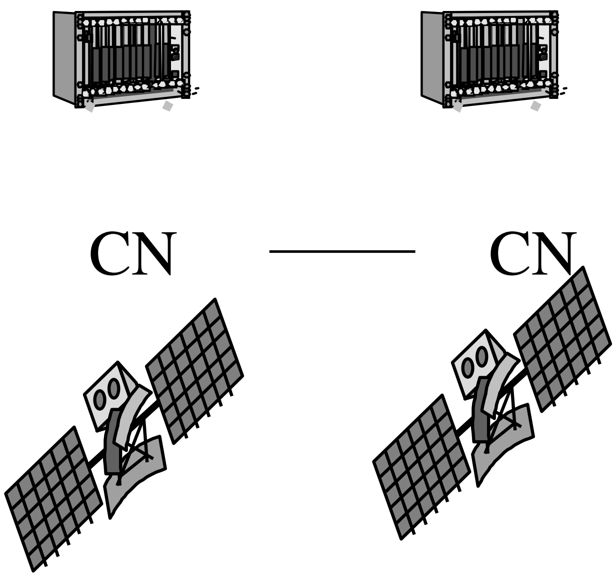
- Call management
- Mobility management

- HLR and VLR

- Mobile IP

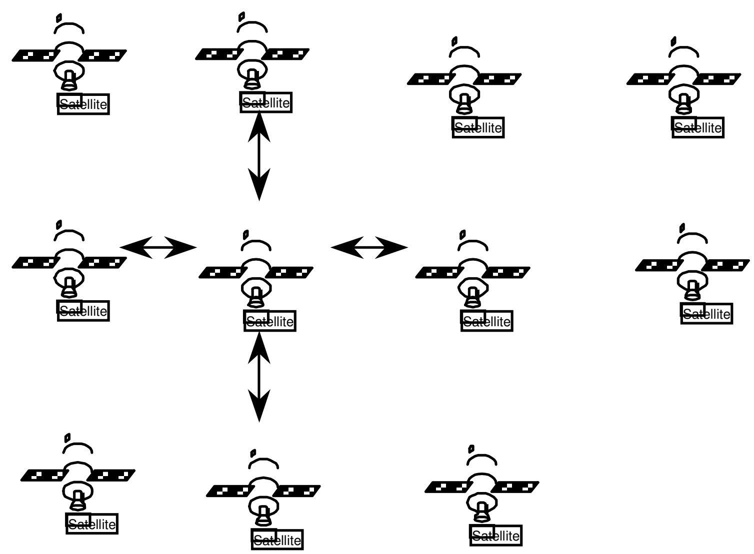
- IP cellular
- MANET
  - Mobile ad hoc network

Core network interface



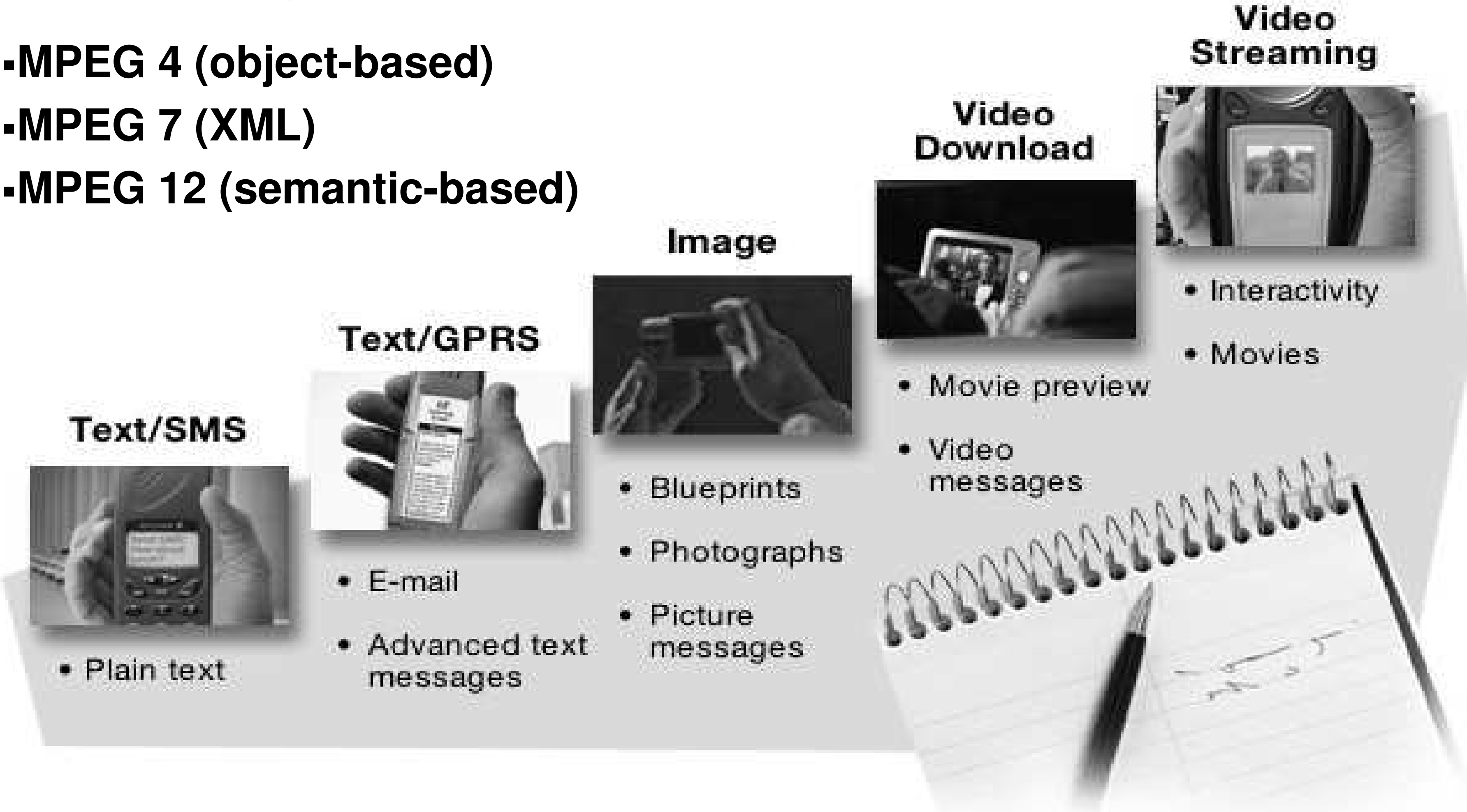
- **ATM then IP interfaces**
  - **Policy-based Internet**

- **Interface between the different members of the IMT-2000 family.**



Impact of the bandwidth on video stream

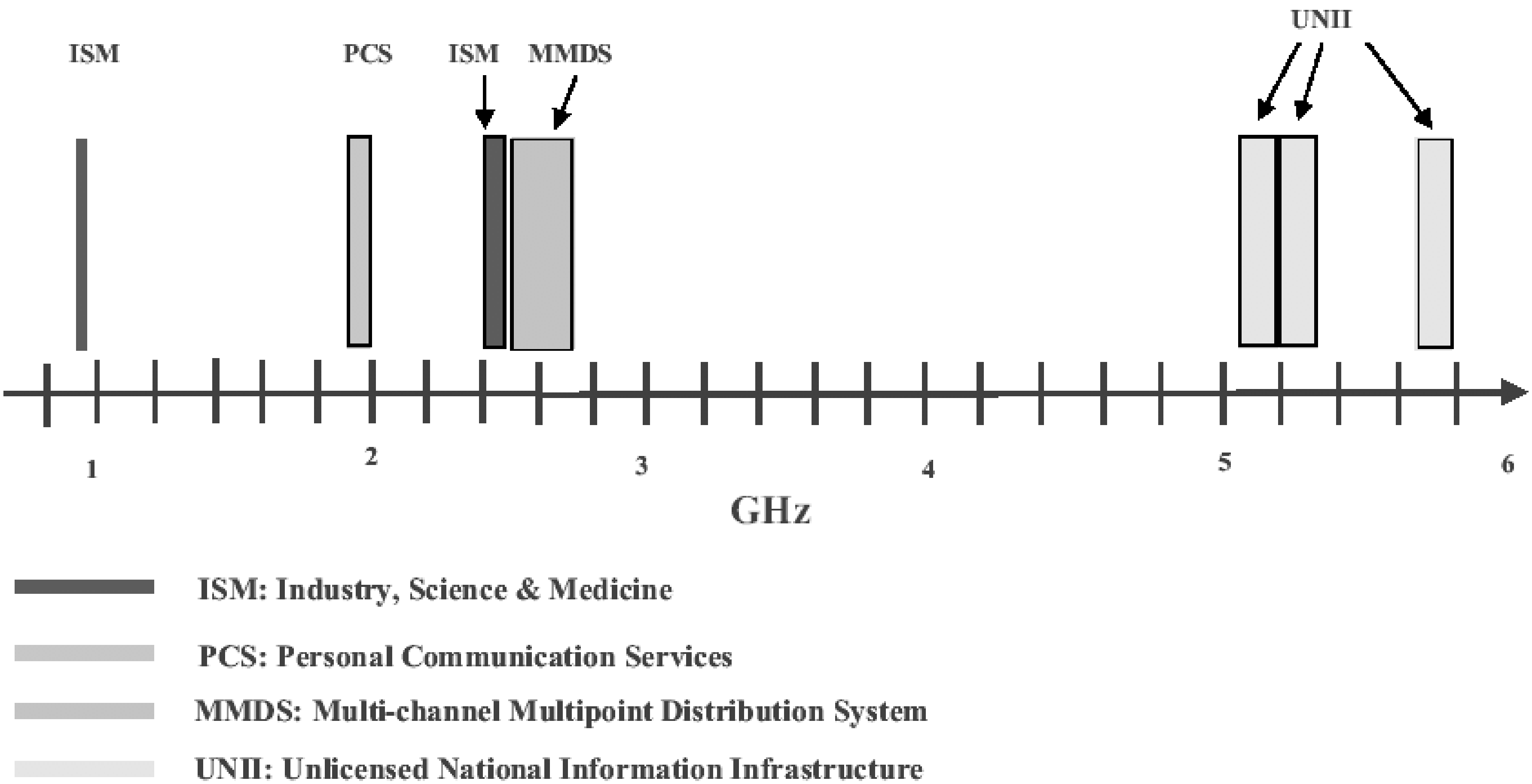
- MPEG 4 (object-based)
- MPEG 7 (XML)
- MPEG 12 (semantic-based)



SAMU project (with Motorola, Renault, Cegetel, etc.)

Wireless networks

Unlicensed bands



IEEE 802.15

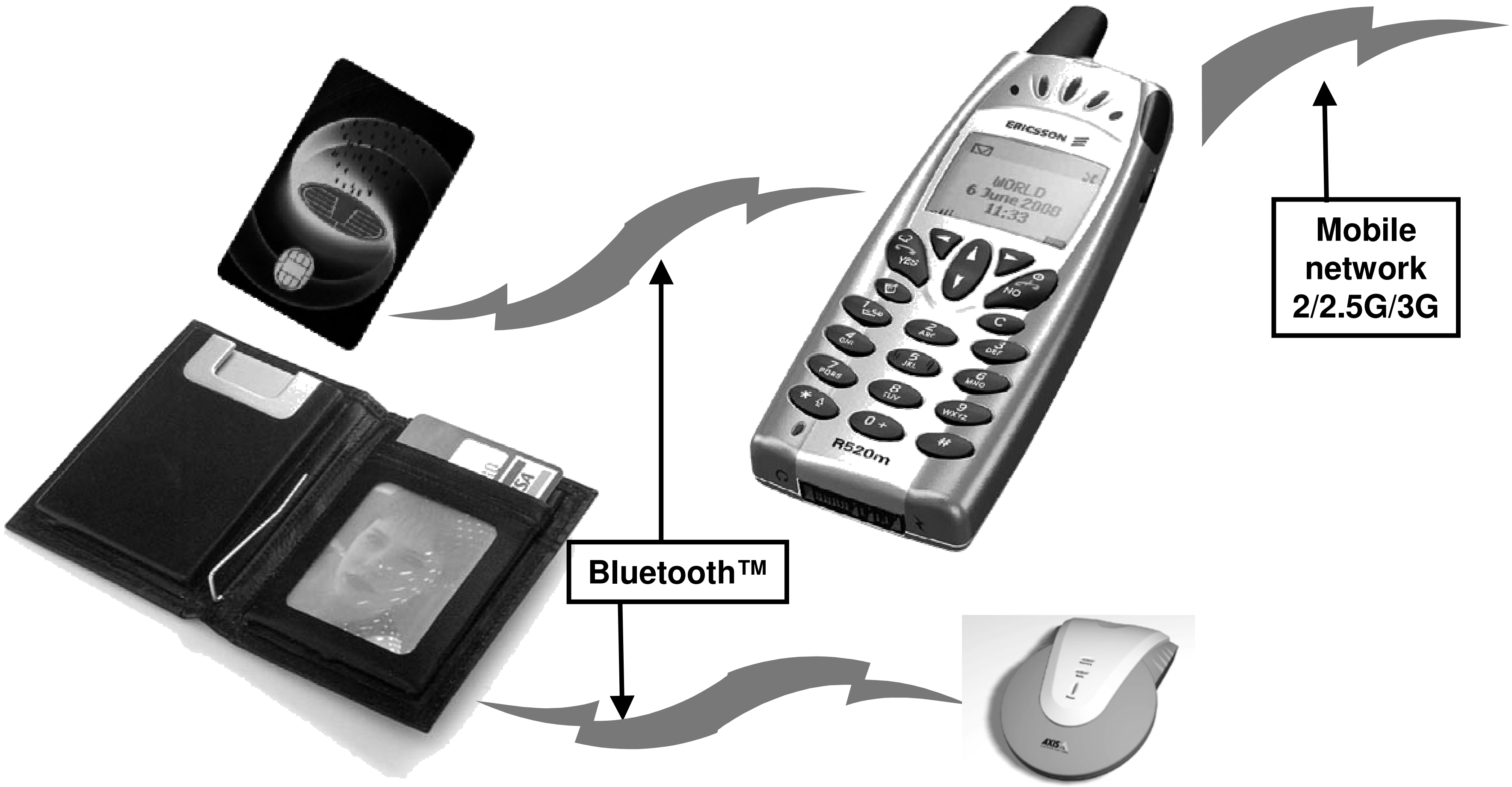
WPAN: Wireless Personal Area Network

Bluetooth

Bluetooth phone

Concept phone

Bluetooth connection for e-business



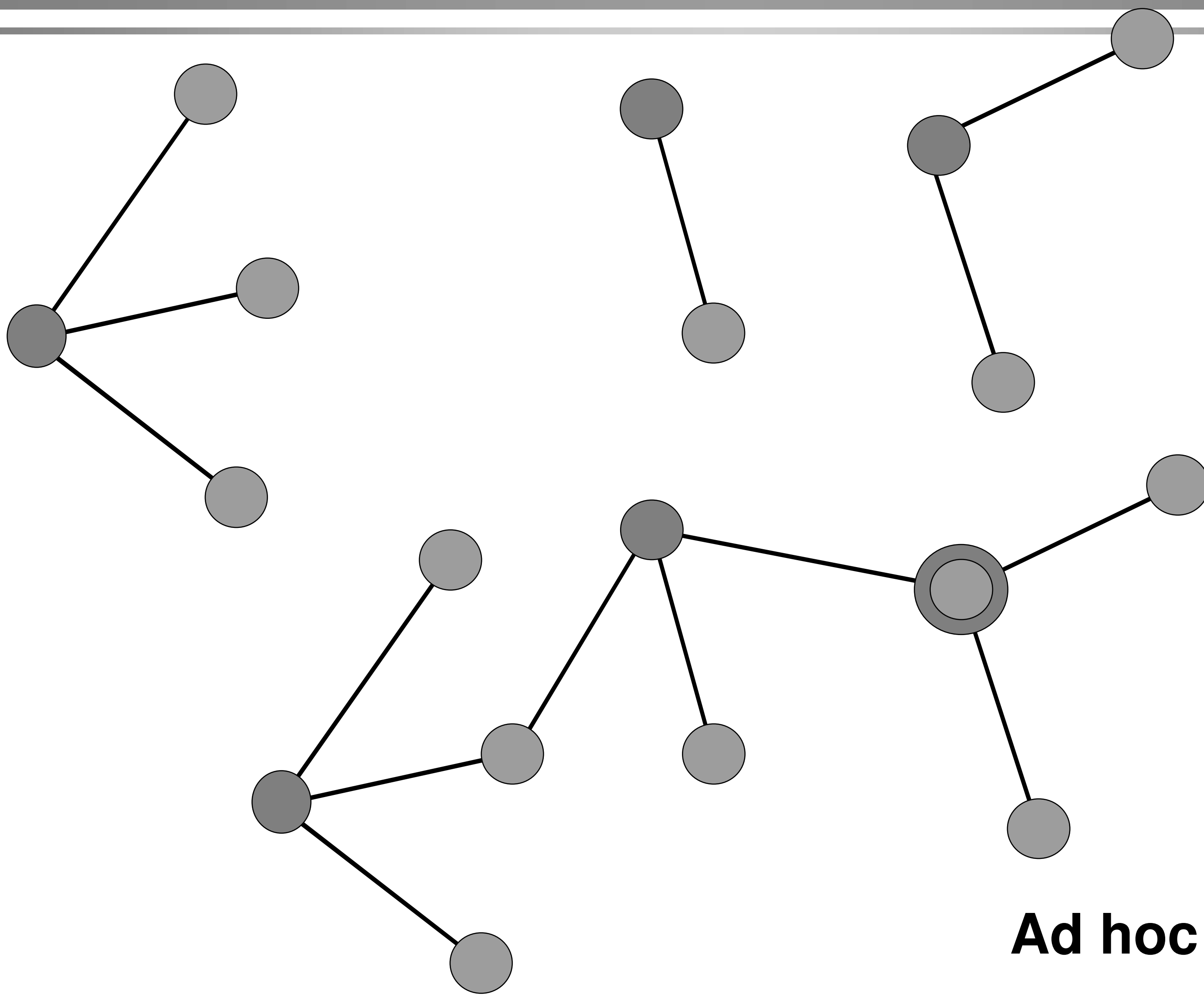
Bluetooth

- **Frequencies between 2 400 and 2 483,5 Mhz**
- **79 channel of 1 Mhz.**

- **Piconet: 8 users**
  - **1 master and 7 slaves (polling technique)**
- **Scatternet**

- **Throughput**
  - **433,9 Kbit/s for a full duplex communication**
  - **723,2 Kbit/s and 57,6 in the other direction**
  - **64 Kbit/s for synchronous communications**
  - **1 asynchronous channel and up to 3 synchronous channels**

Bluetooth:piconet and scatternet



Ad hoc network

IEEE 802.11

IEEE 802.11b

IEEE 802.11a

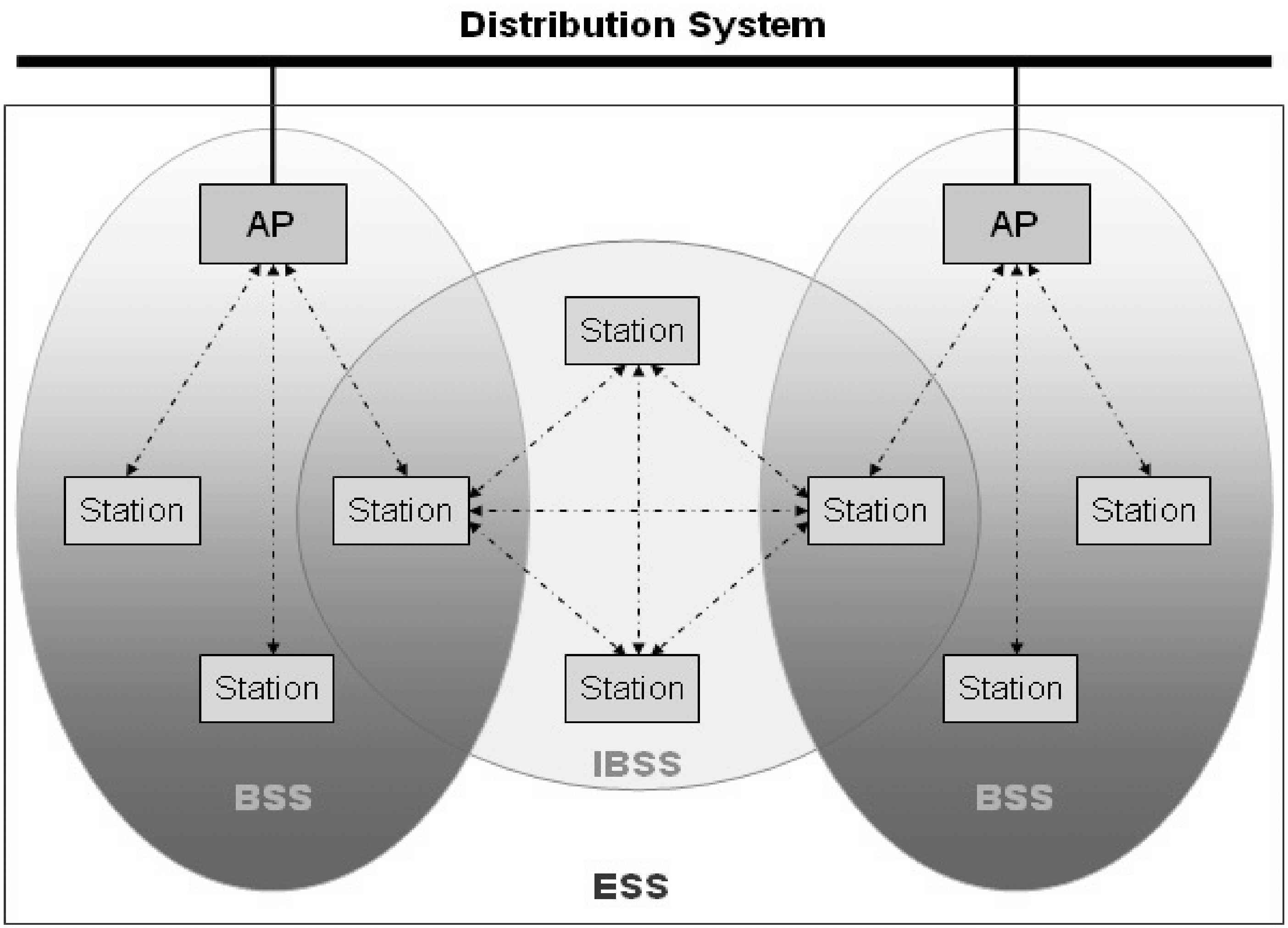
IEEE 802.11e

IEEE 802.11

IEEE 802.11b

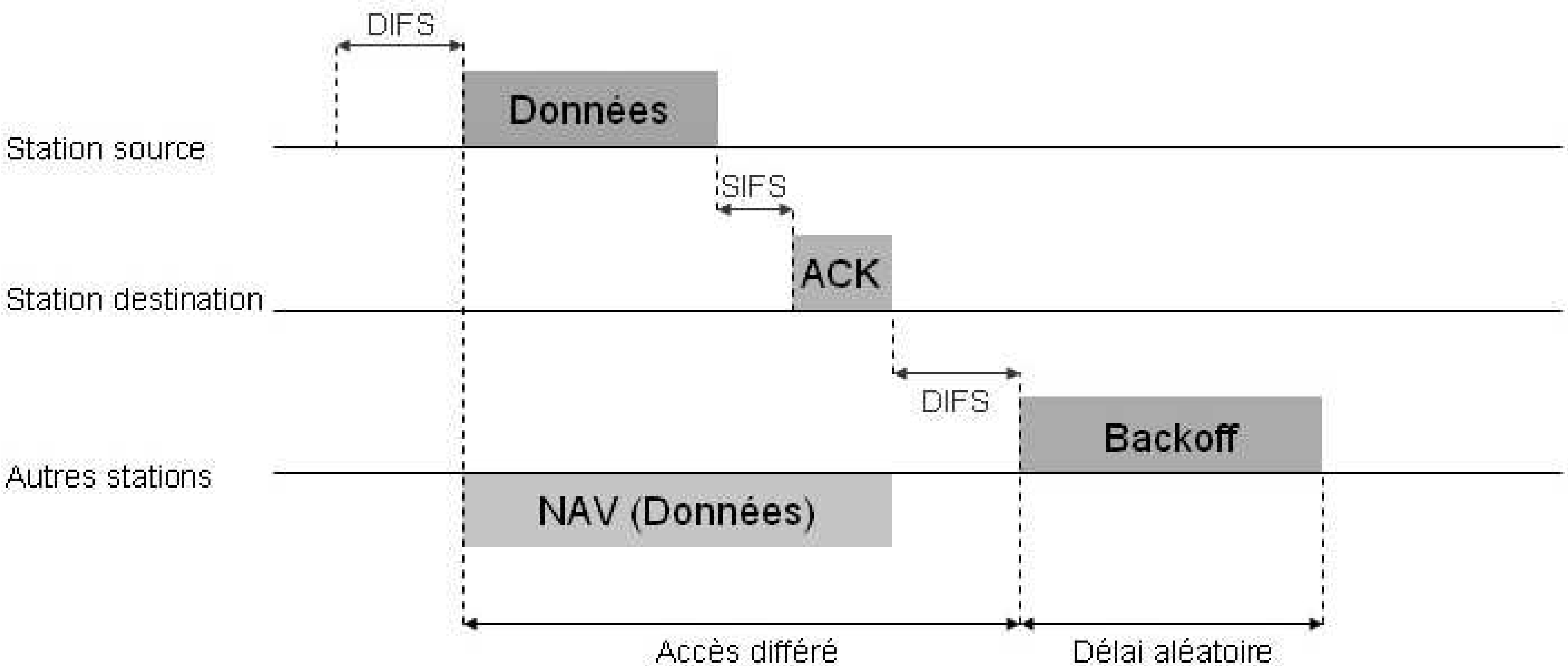
11 Mbps

IEEE 802.11

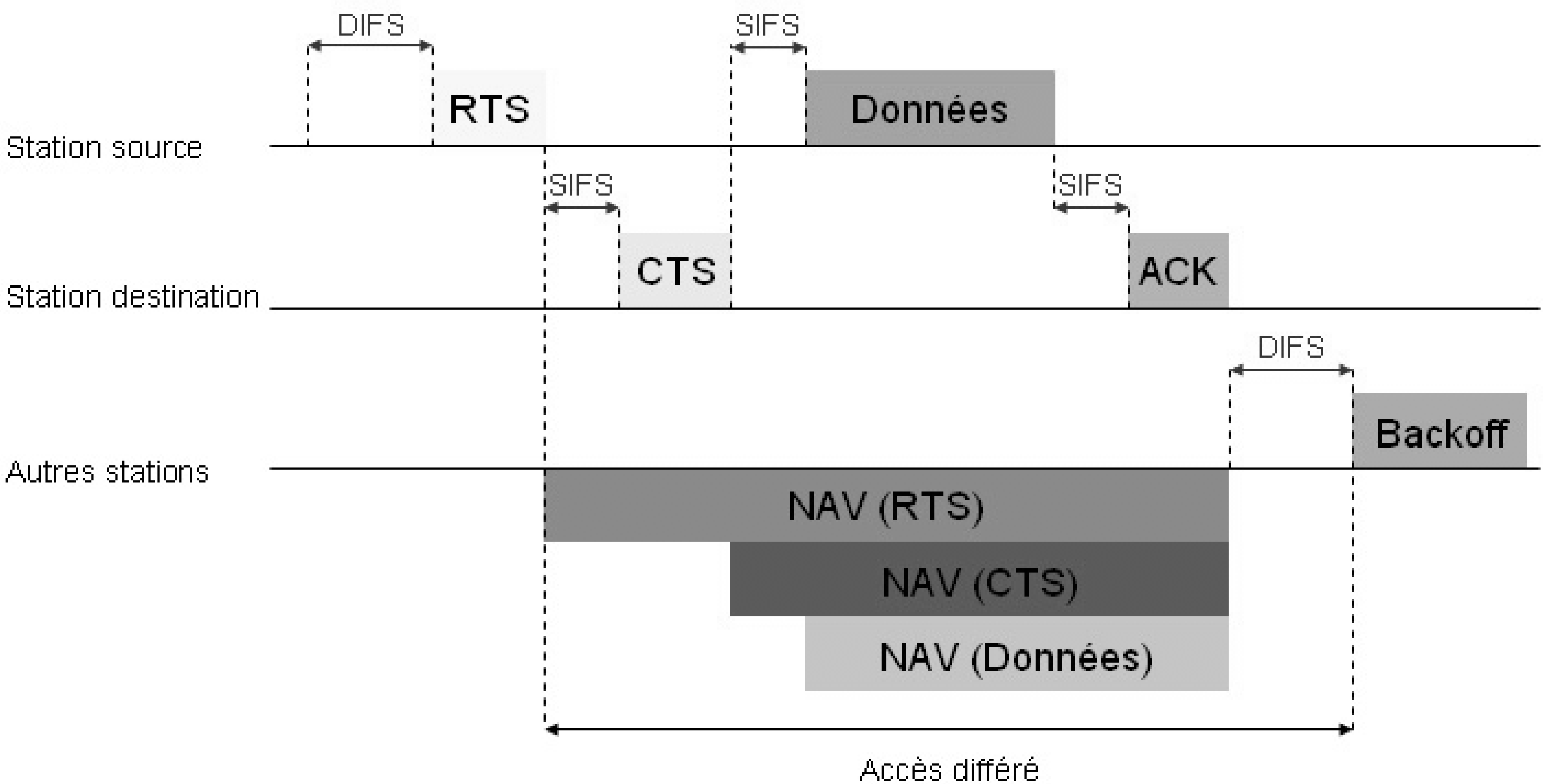


Distribution System
AP
AP
Station
Station
Station
Station
Station
Station
Station
Station
IBSS
BSS
BSS
ESS

IEEE 802.11 : CSMA/CA



CSMA/CA for hidden station

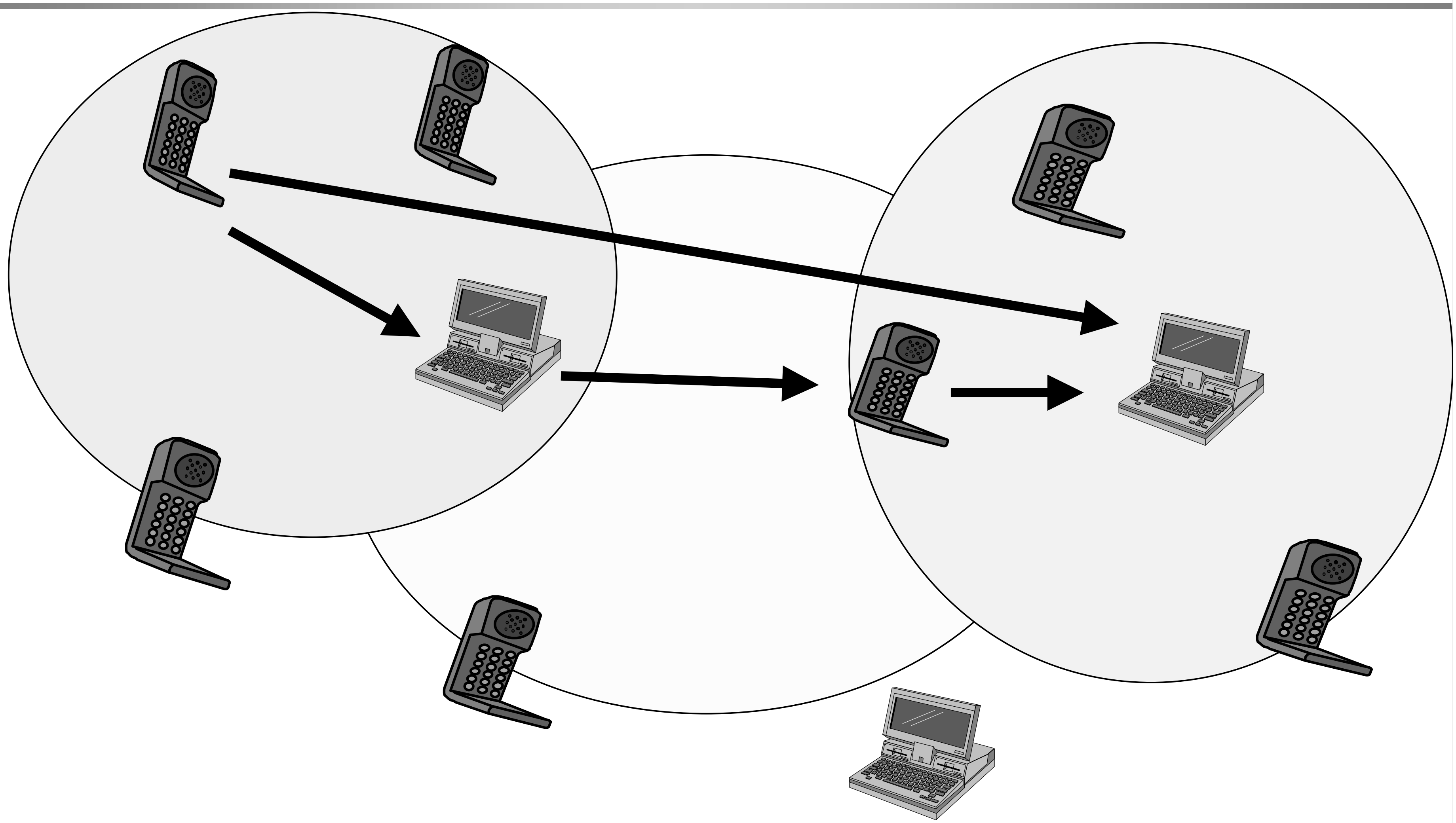


IEEE 802.11a

- **HiperLAN 2 (MAC + ATM) from ETSI**
- **IEEE 802.11a**
  - **– 802.11a operate on the 5 GHz frequency on the unlicensed band UNII.**
  - **– 802.11a use OFDM modulation with 52 carriers permitting excellent performance even with multiple paths.**
  - **– 802.11a proposes 8 speeds from 6 to 54 Mbps.**

- **Ad hoc network**

MANET (Mobile Ad-hoc Networks)



IEEE 802.11e

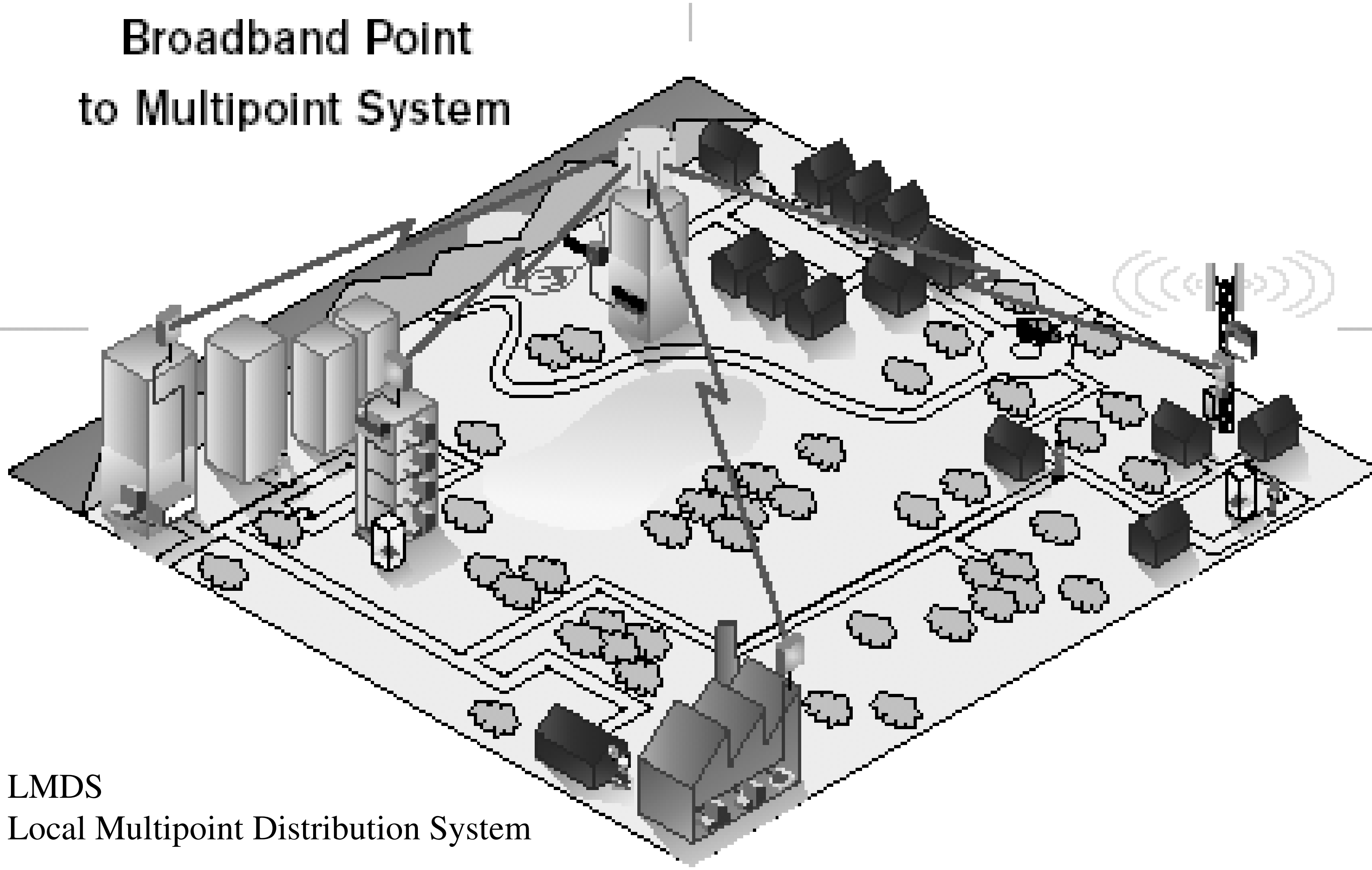
- **IEEE 802.11 phone**
- **IEEE 802.11e for the quality of service**

IEEE 802.16

WLL: Wireless Local Loop

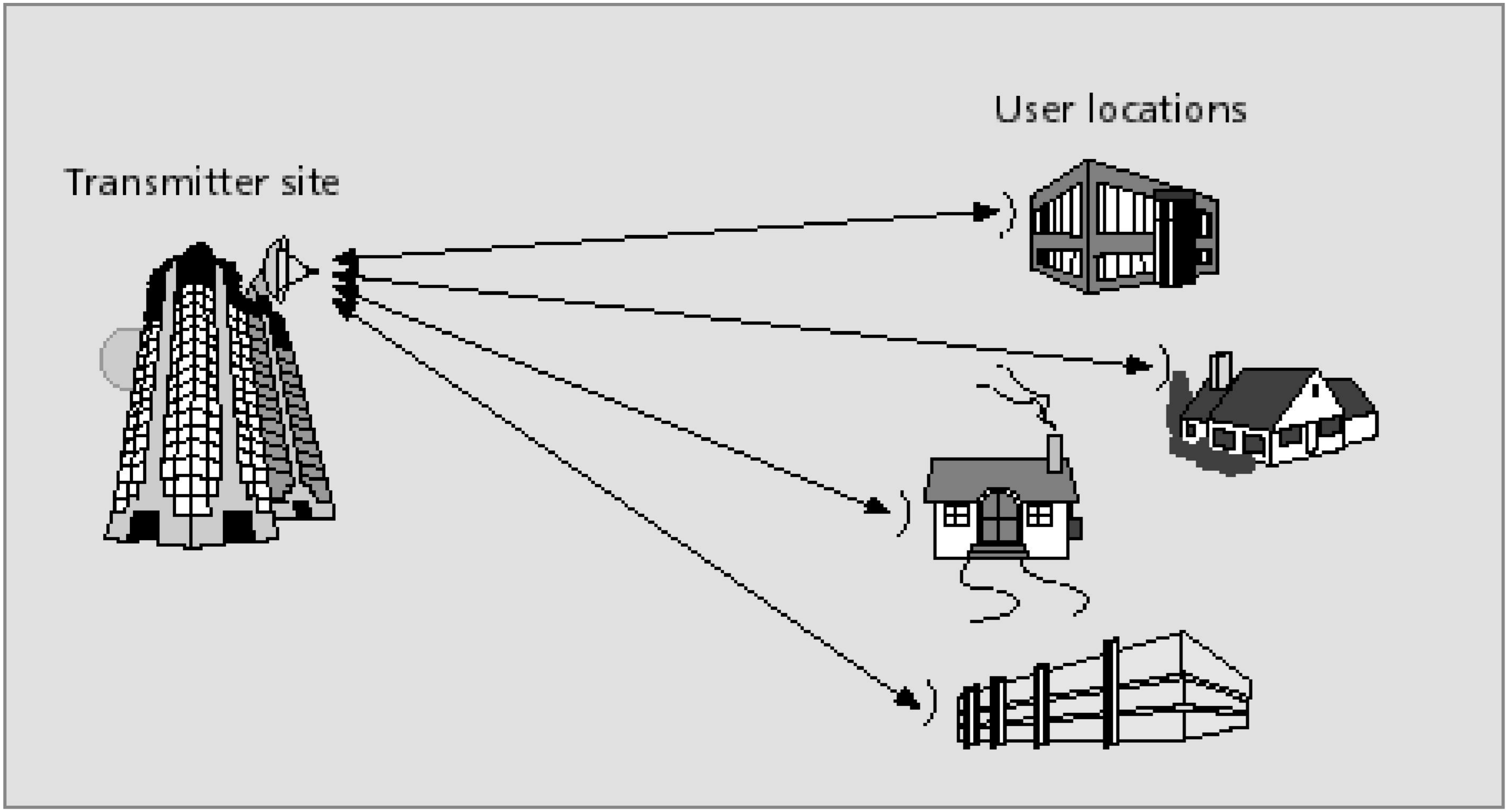
LMDS: Local Multipoint Distribution System

WLL Wireless Local Loop

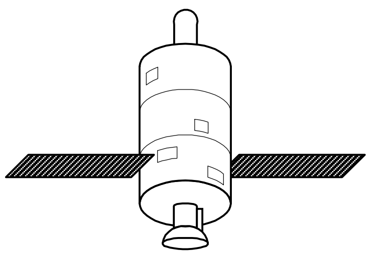


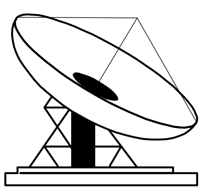
LMDS
Local Multipoint Distribution System

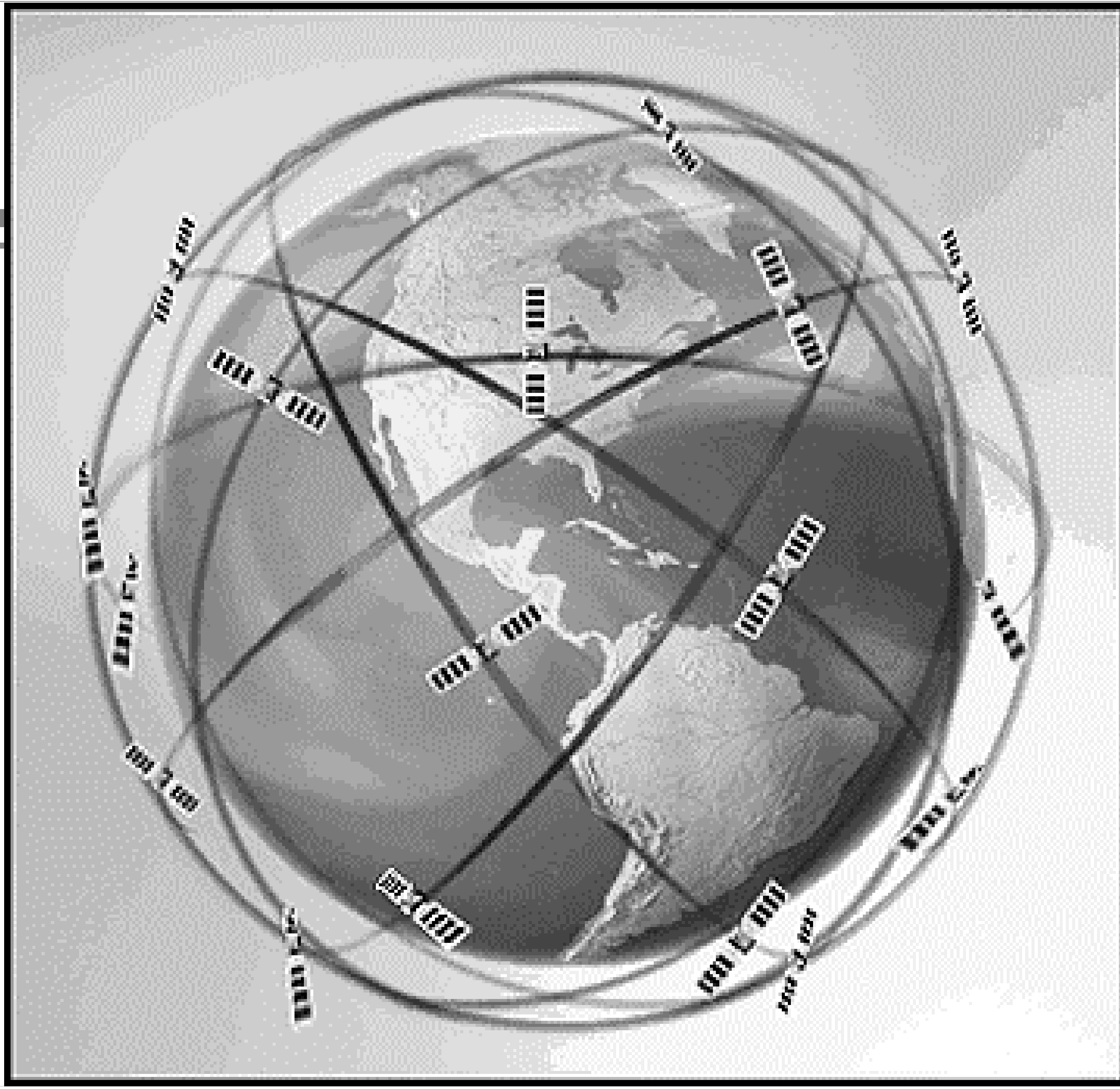
LMDS
Local Multipoint Distribution System

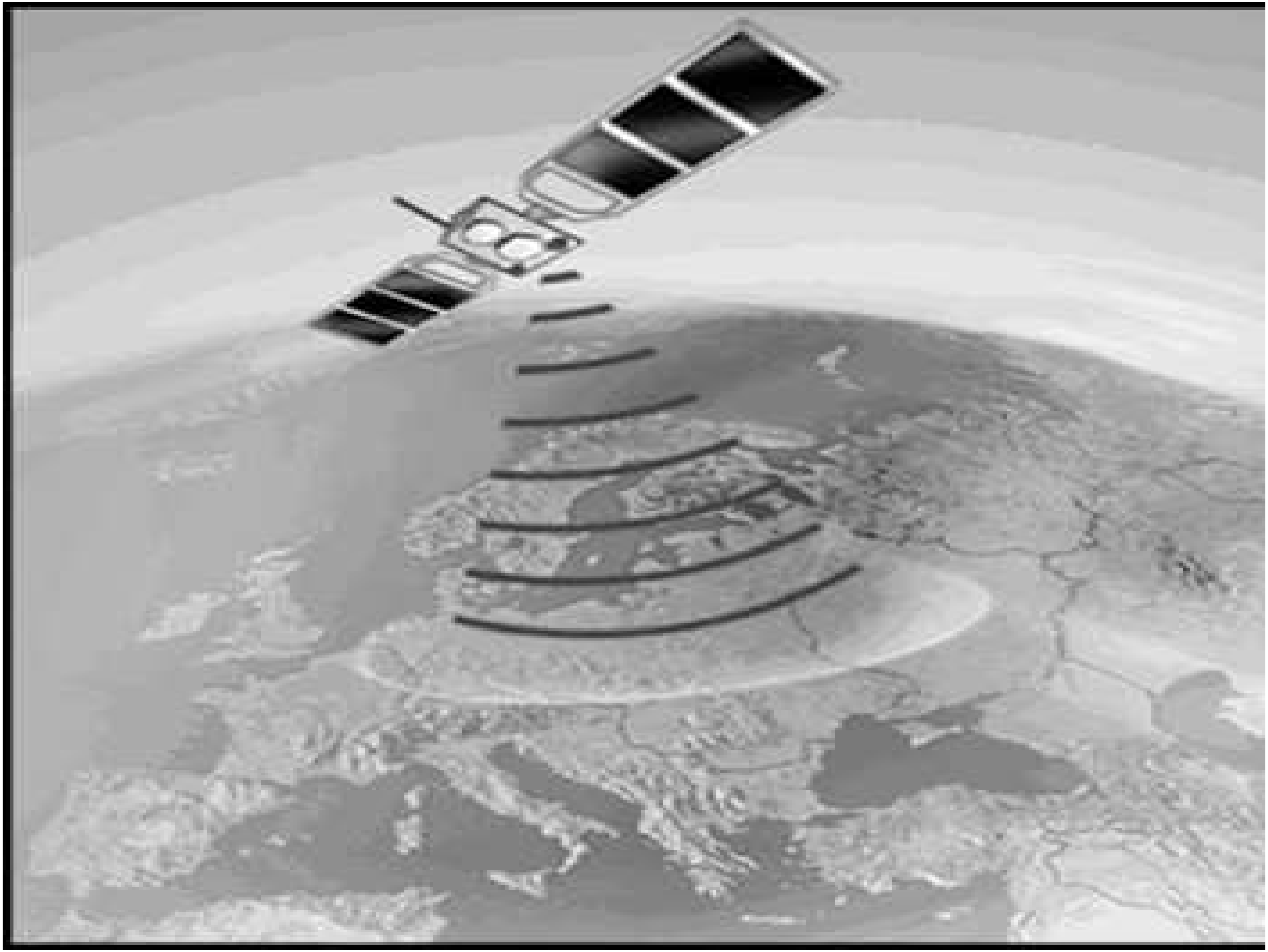


Constellations of satellites

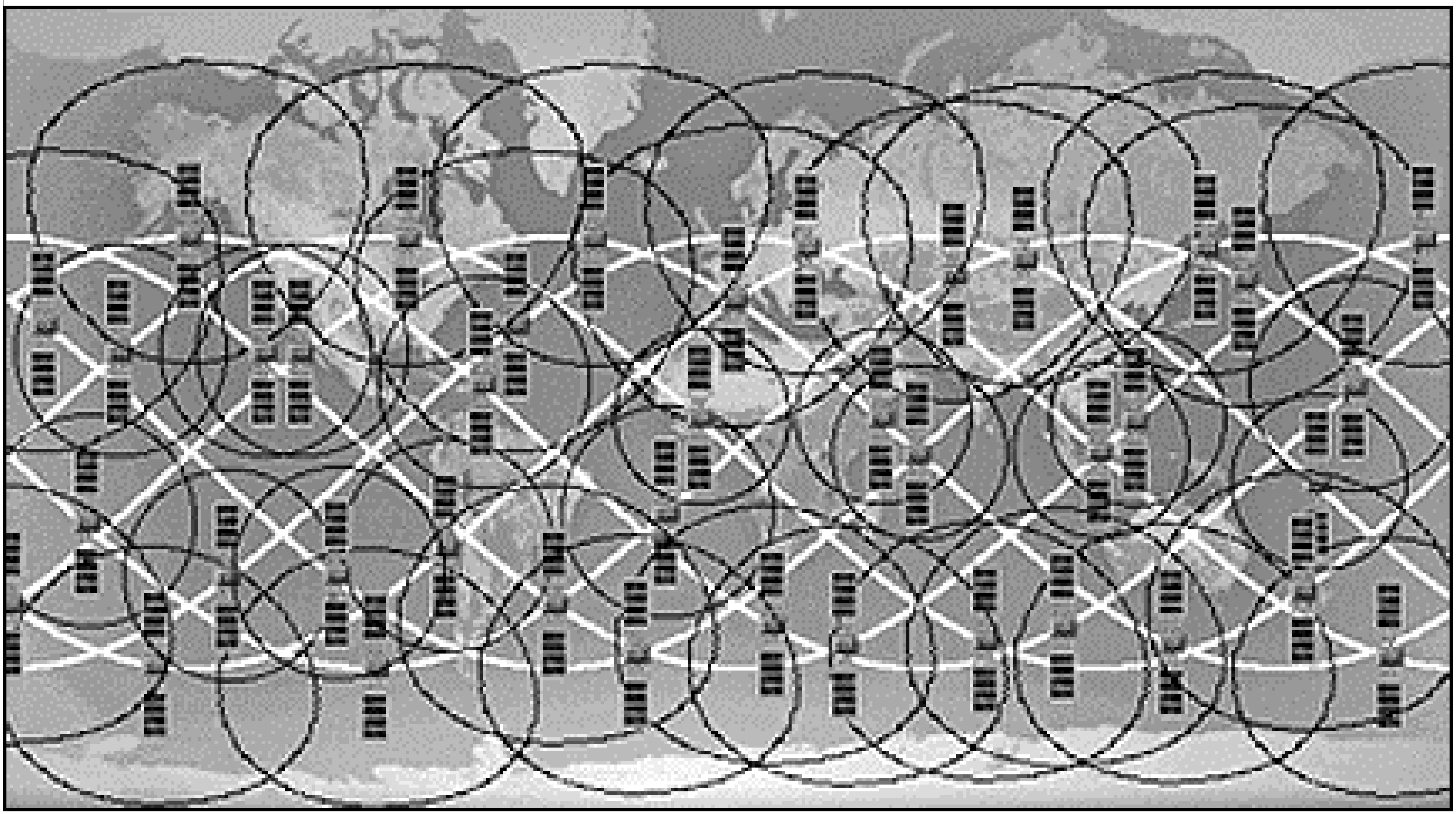




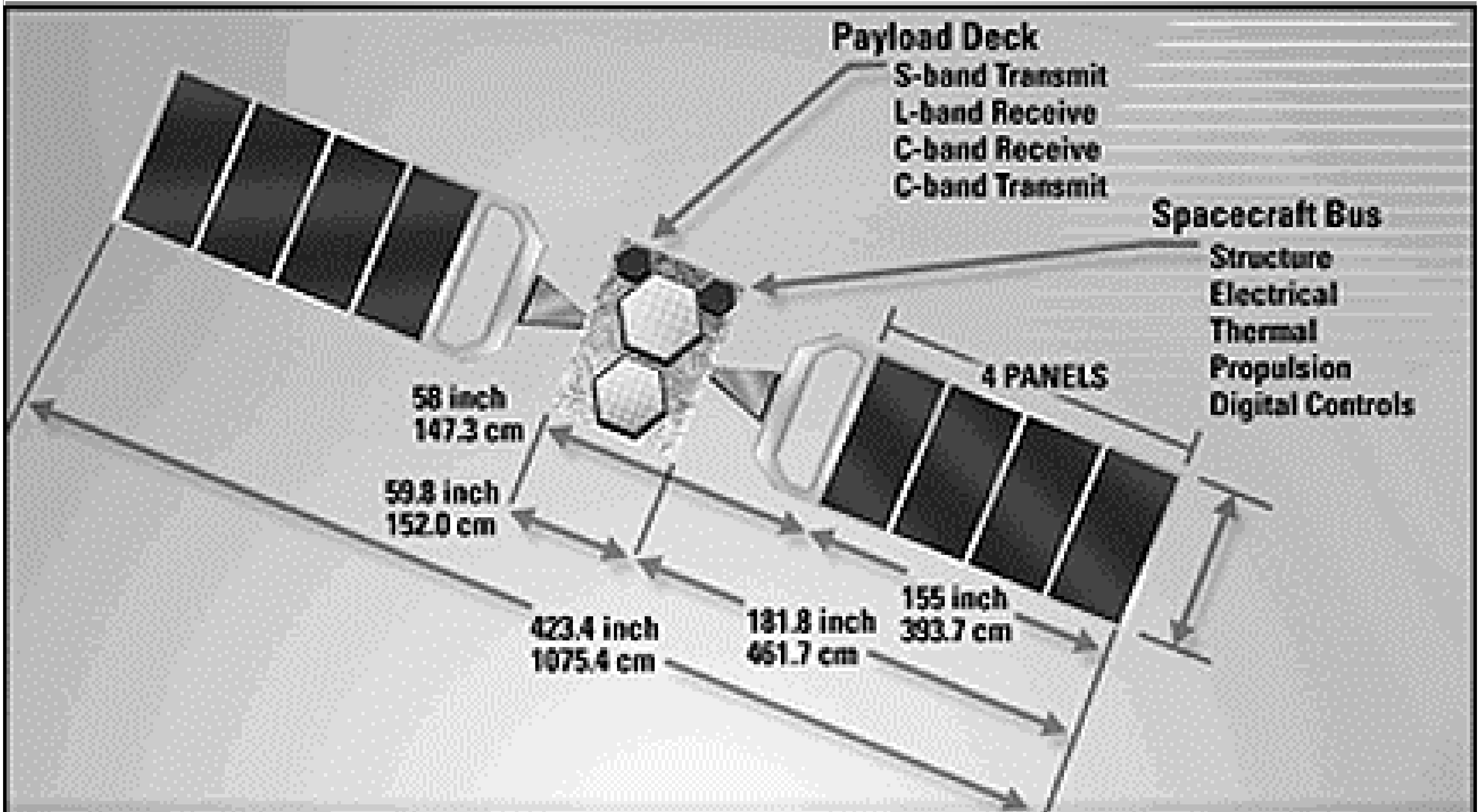


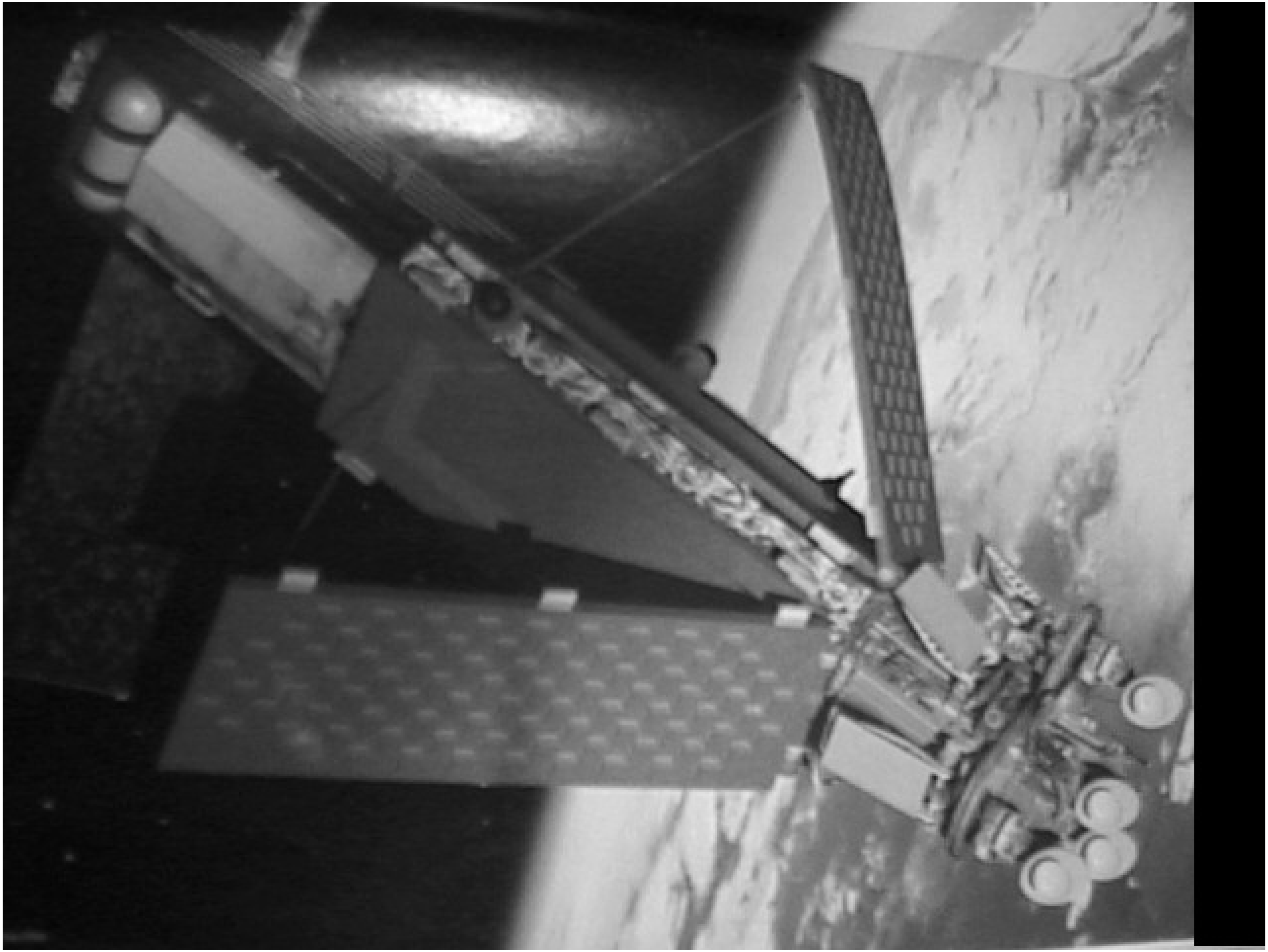


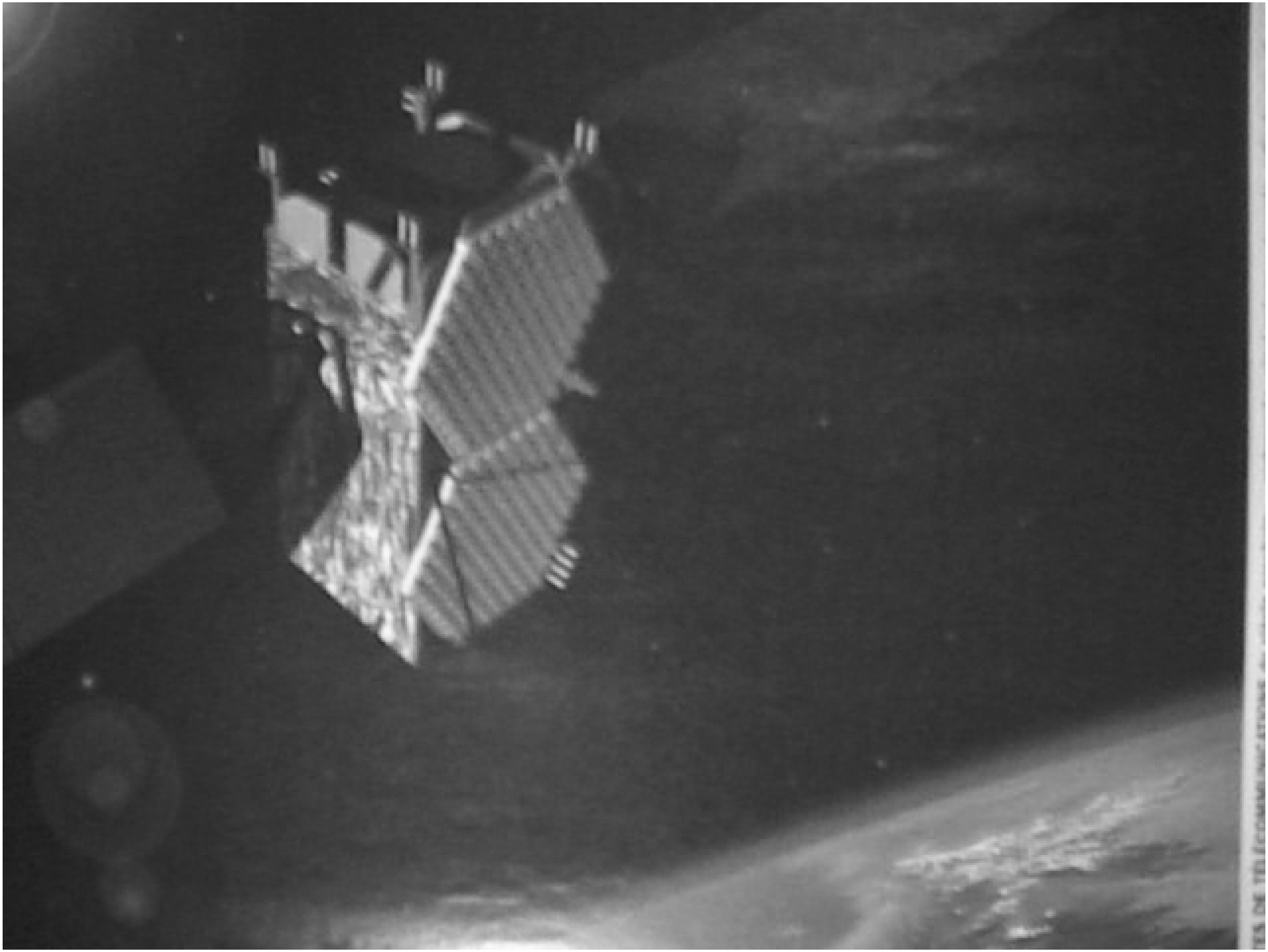
Orbits



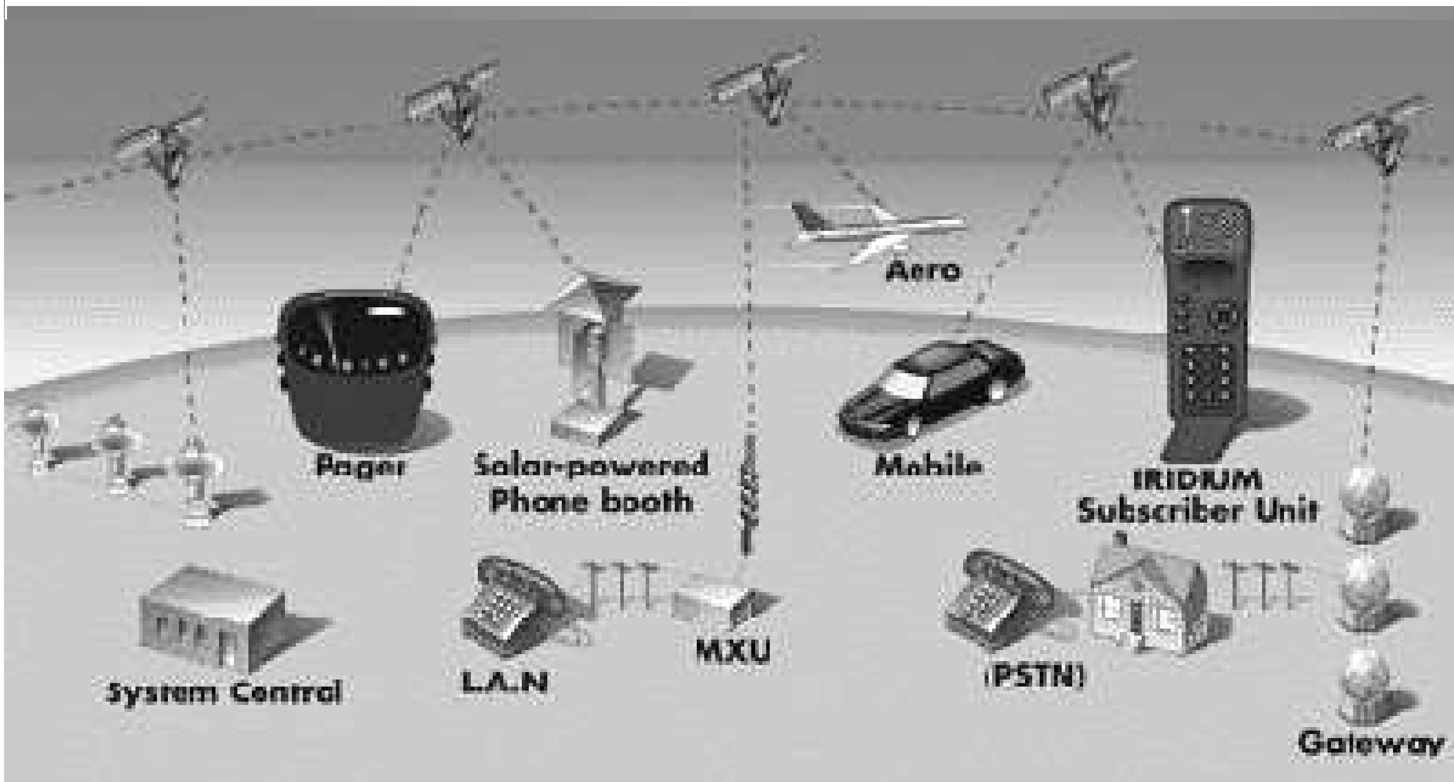
First digital generation





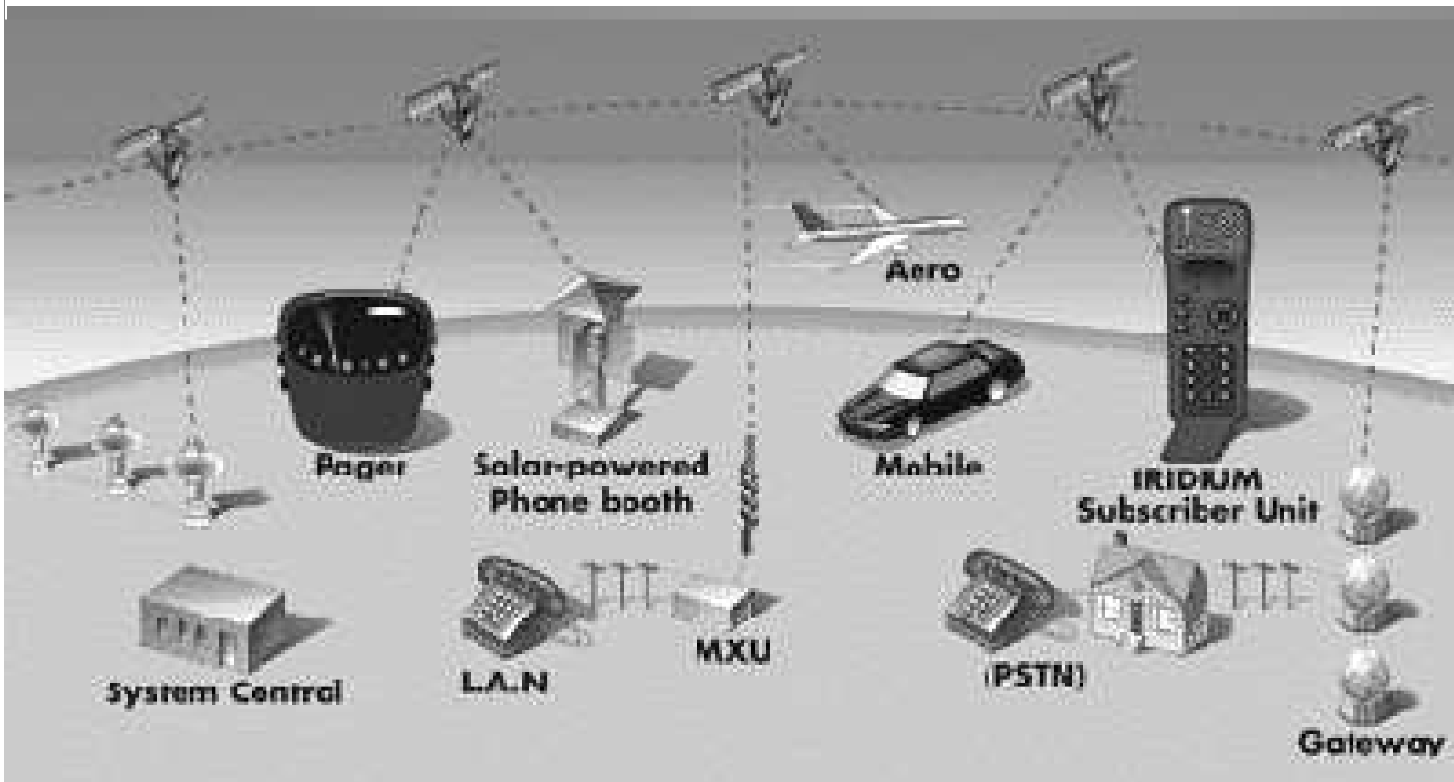


Internet of the sky



- **Voice, fax, data**
- **Large number of satellites**
- **700 km**
- **Inter satellite links**

Internet of the sky

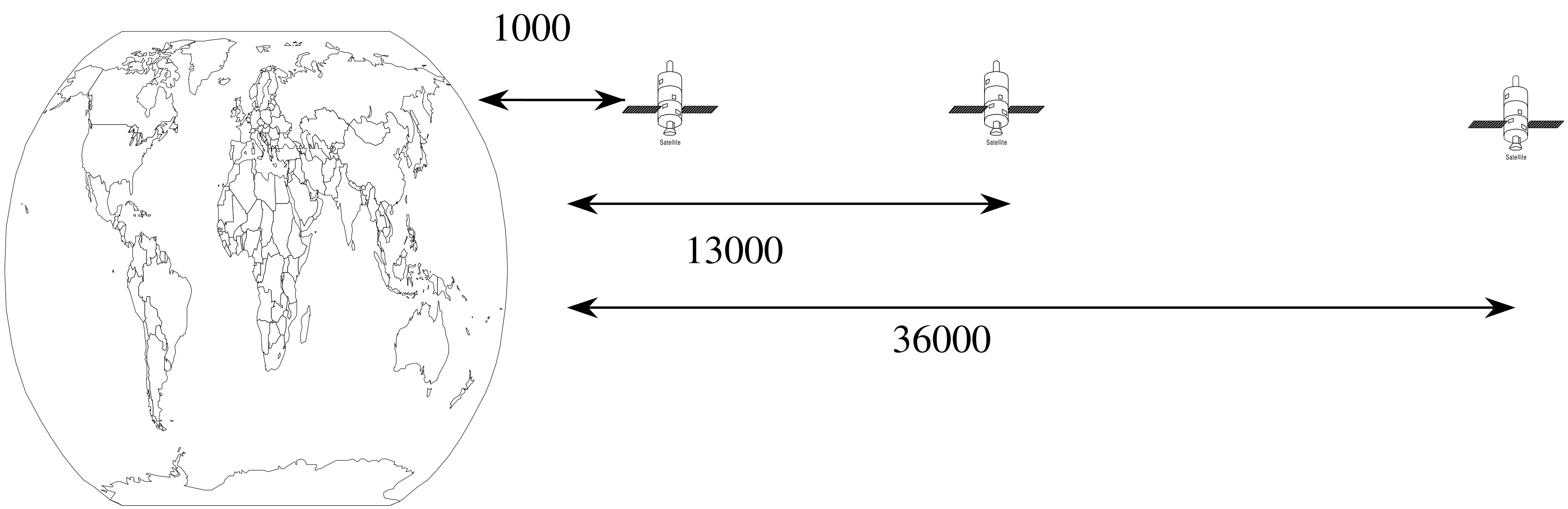


- **Voice, fax, data**
- **Large number of satellites**
- **700 km**
- **Inter satellite links**

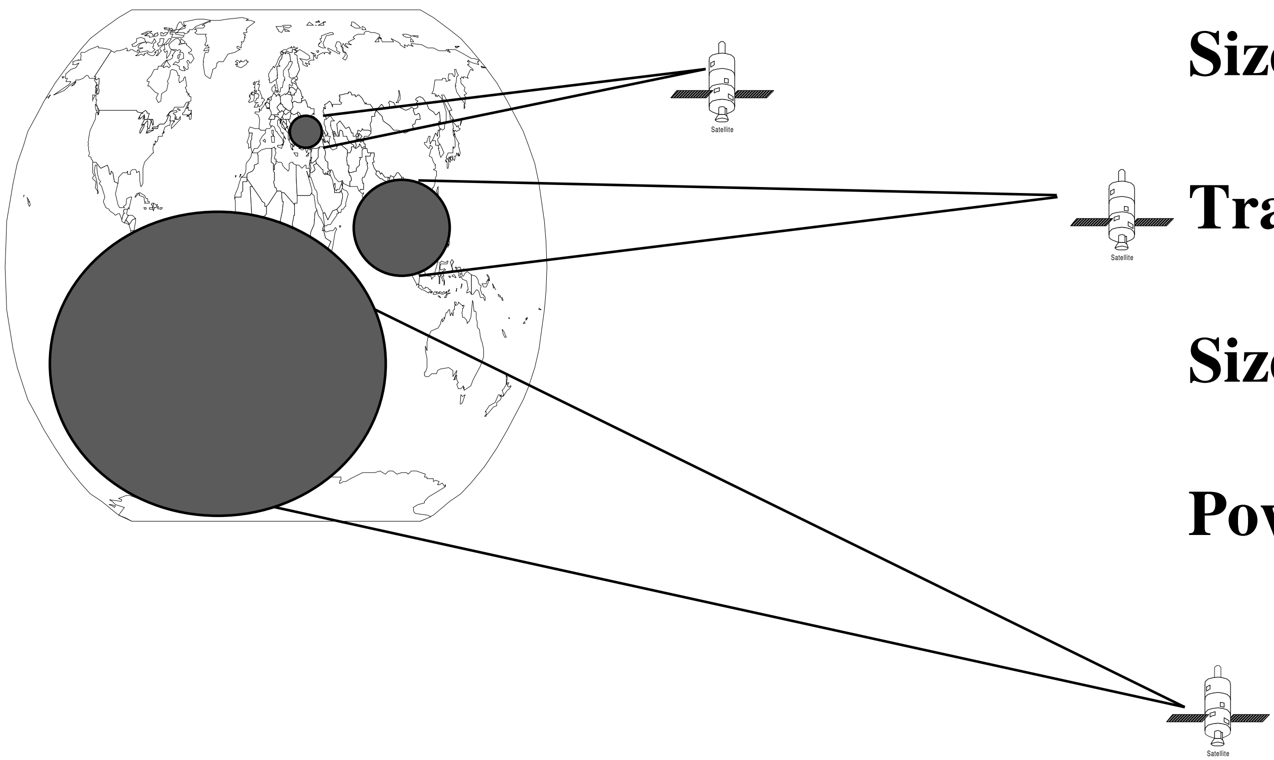
Constellation of satellites

- **GEOS Geosynchronous Orbit Satellite**
- **MEOS Medium Earth Orbit Satellite**
- **LEOS Low Earth Orbit Satellite**
- **8 to 800 satellites for a LEOS system**

Constellation of satellites



Constellation of satellites



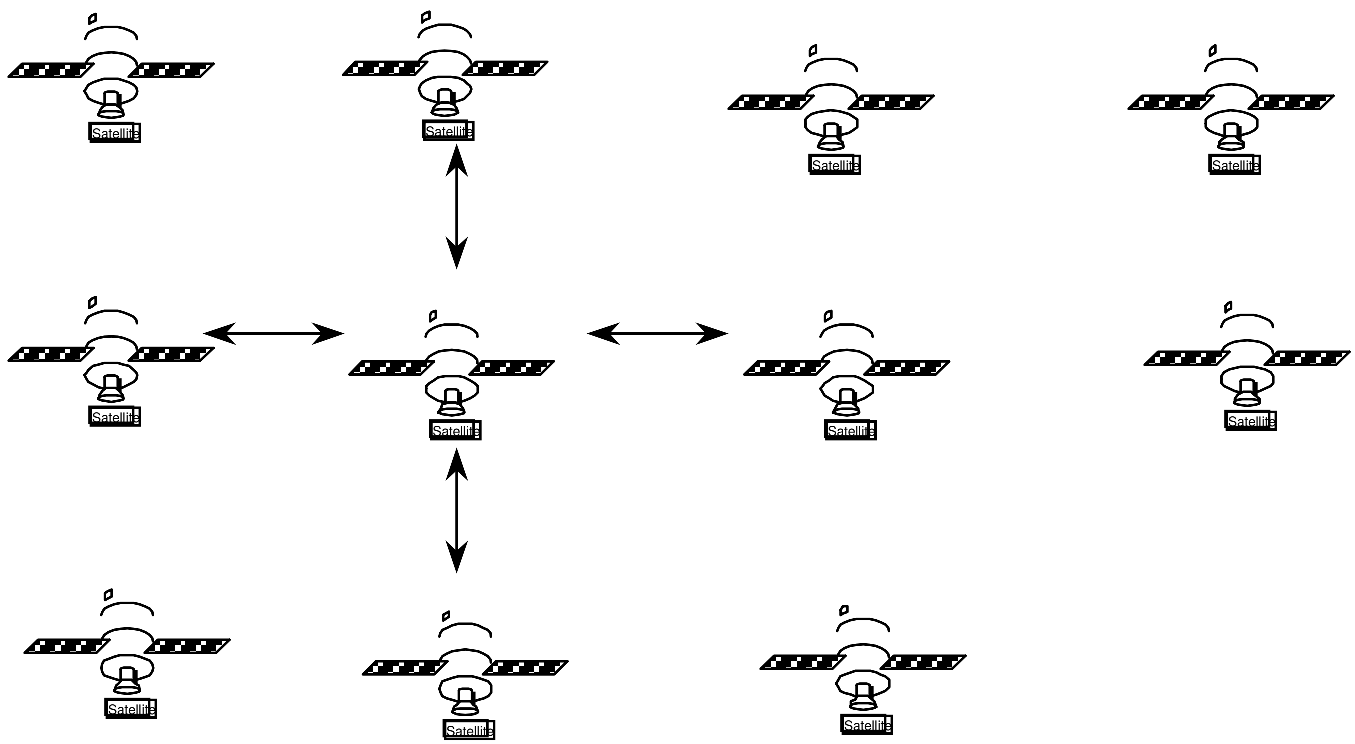
Size of the antenna

Transmission power

Size of the cell

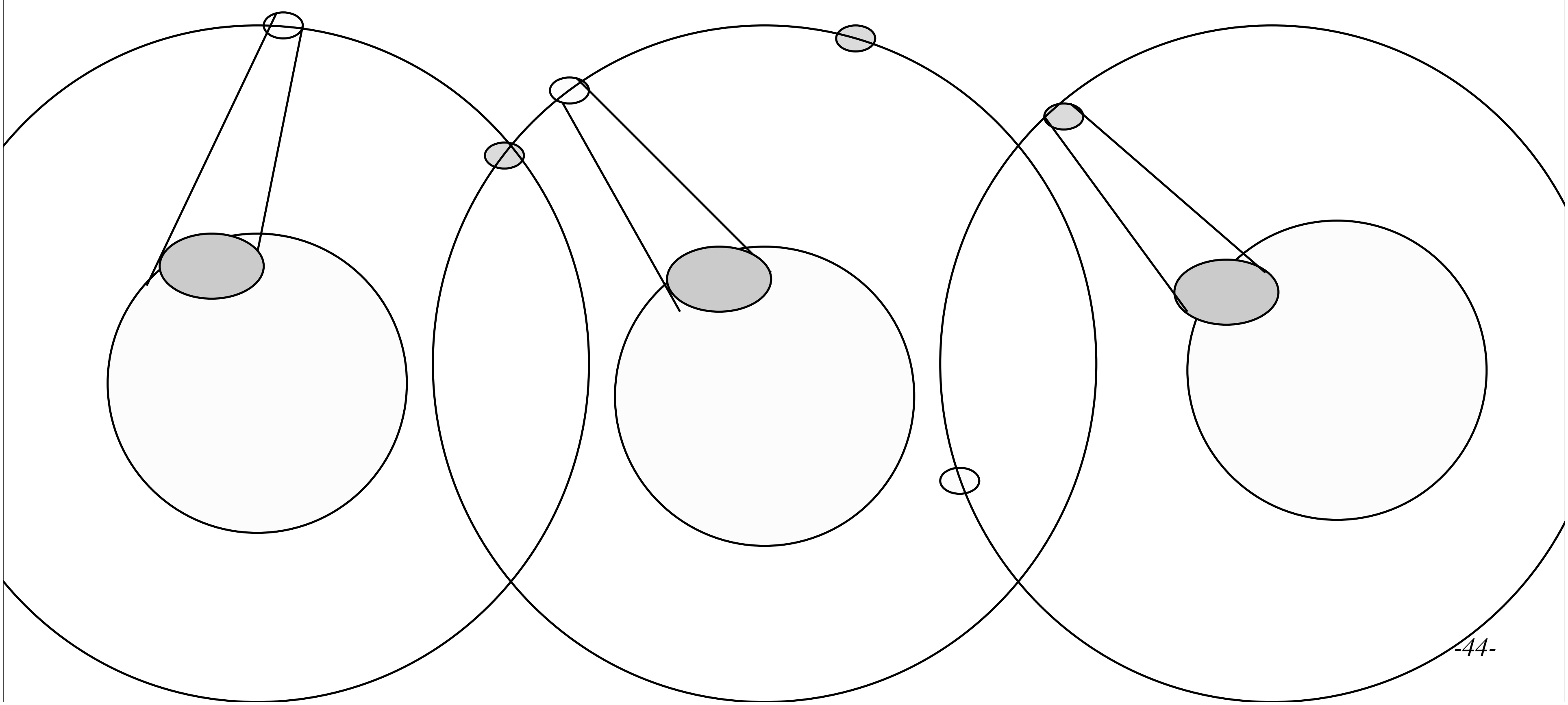
Power of the satellite

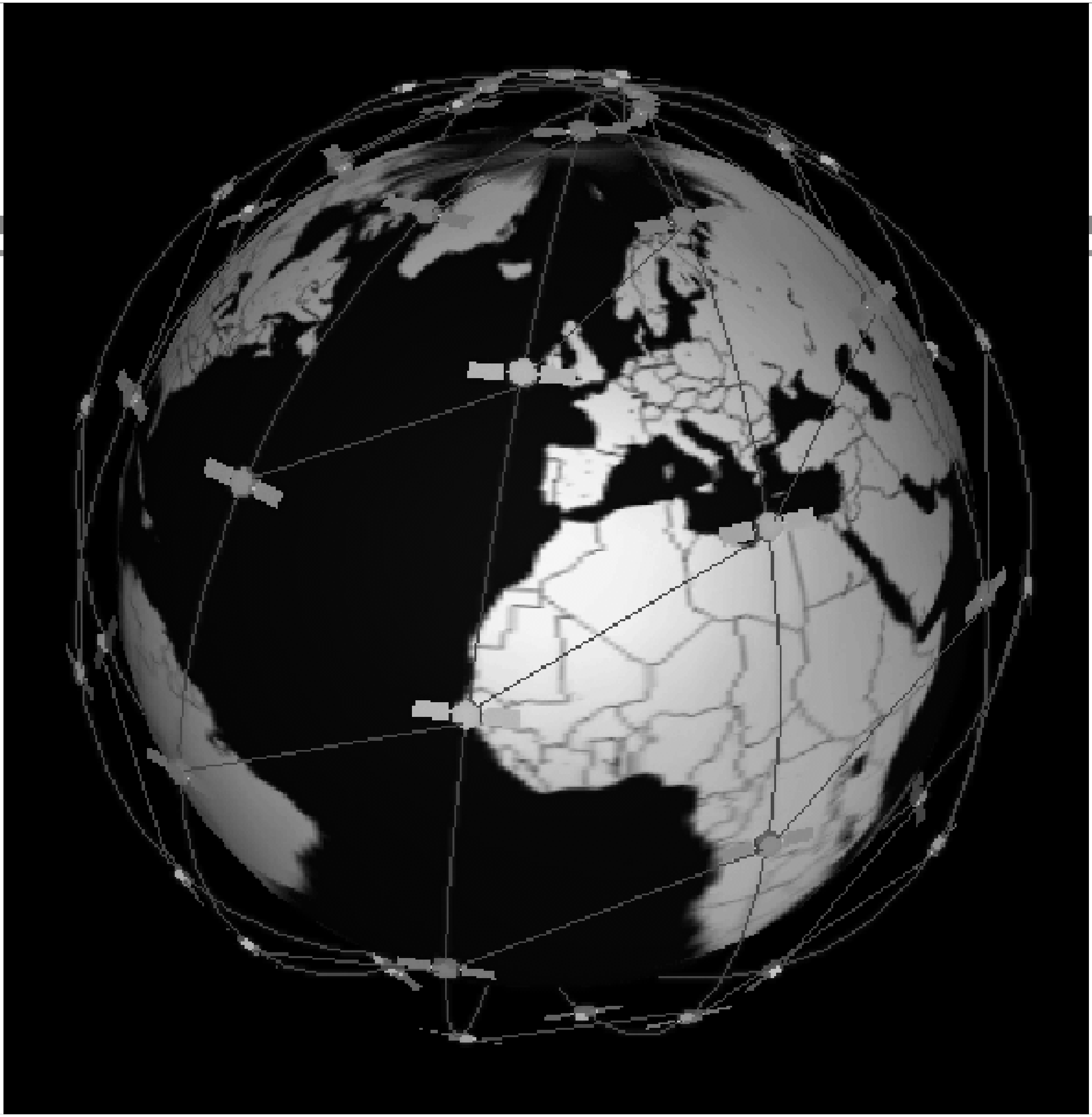
Constellation of satellites

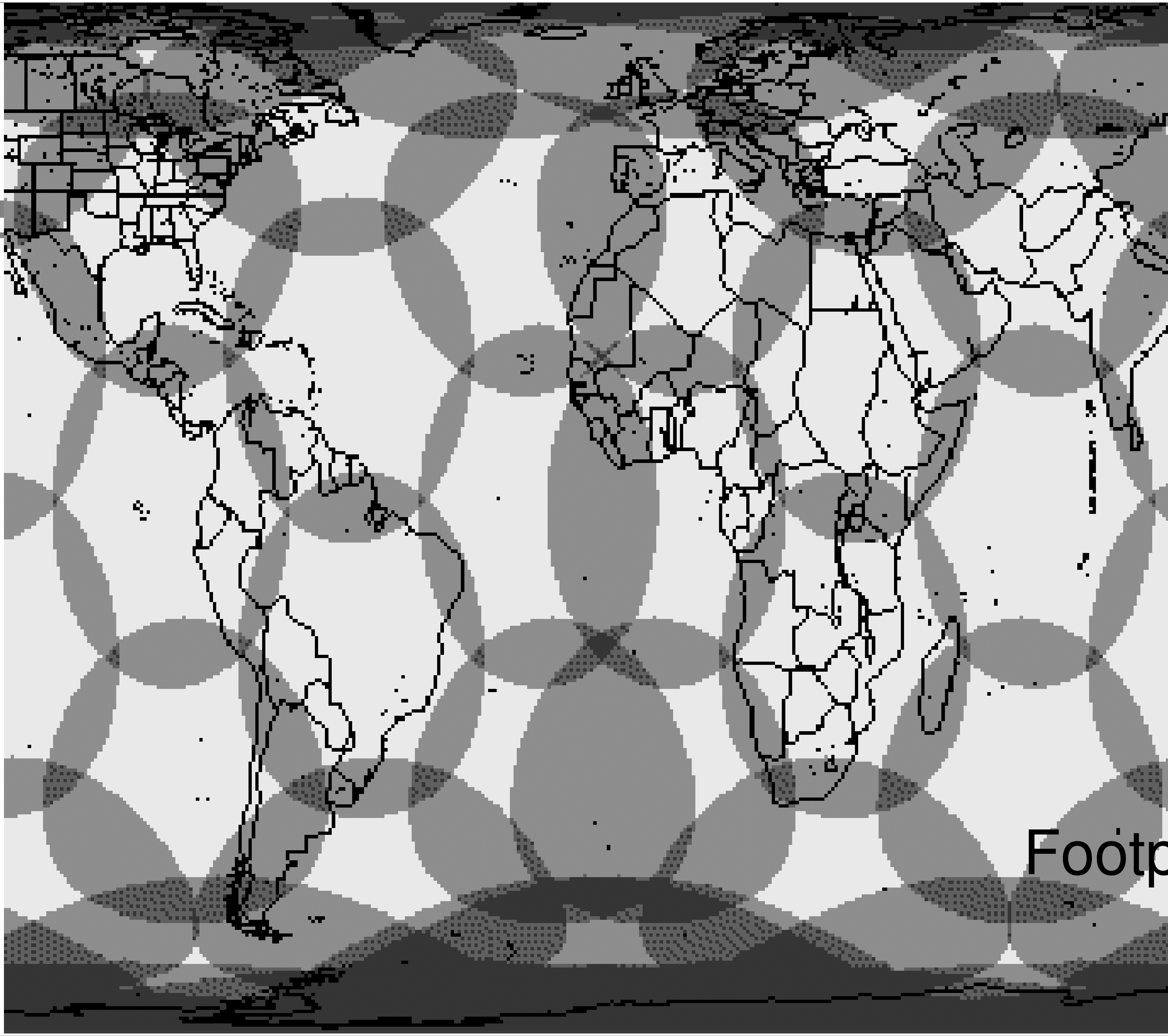


Constellation of satellites

- **Handovers control: Fixed Earth footprint**





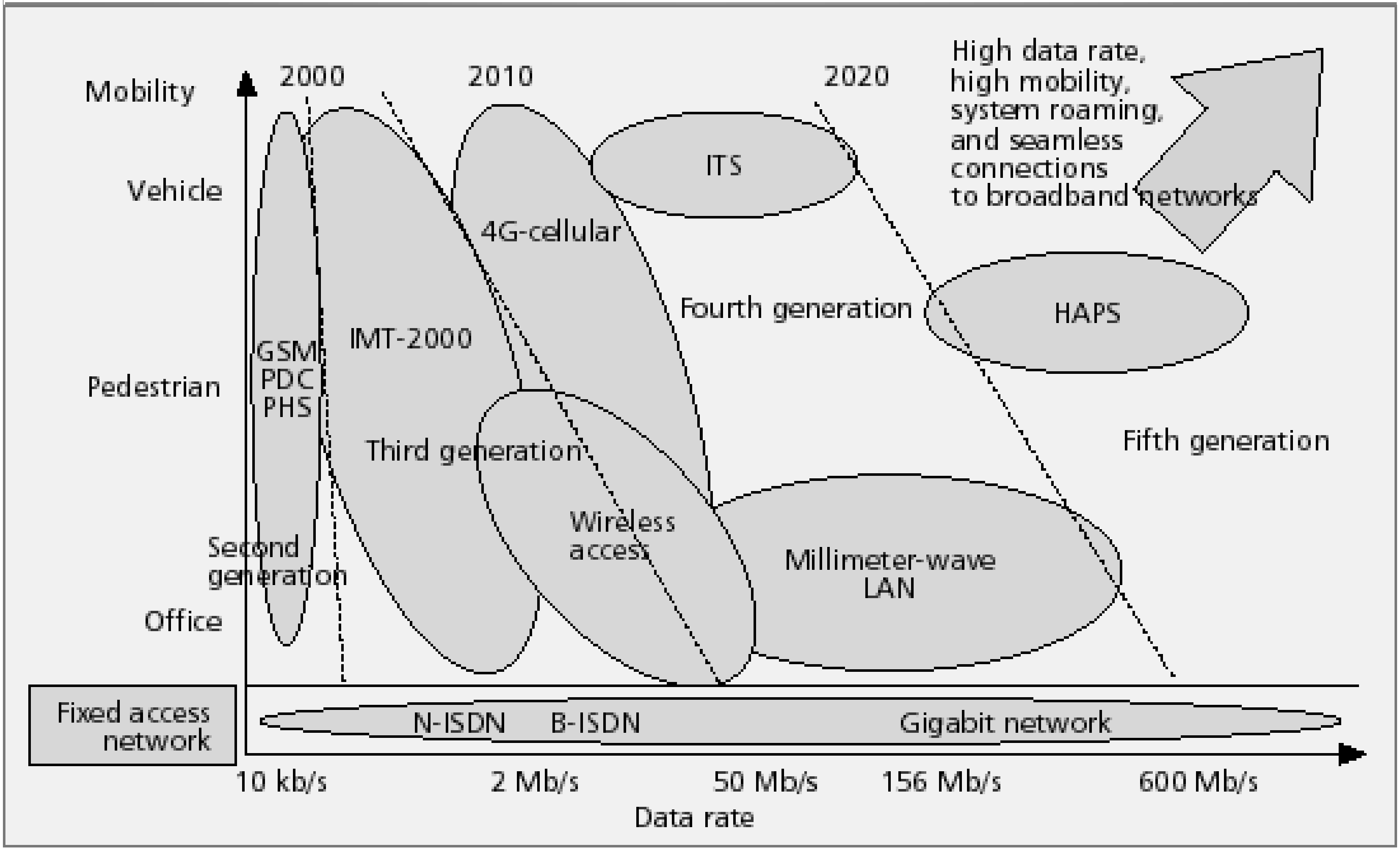


Footprint

4^{th} and 5^{th} generation

4^{th} and 5^{th} generation

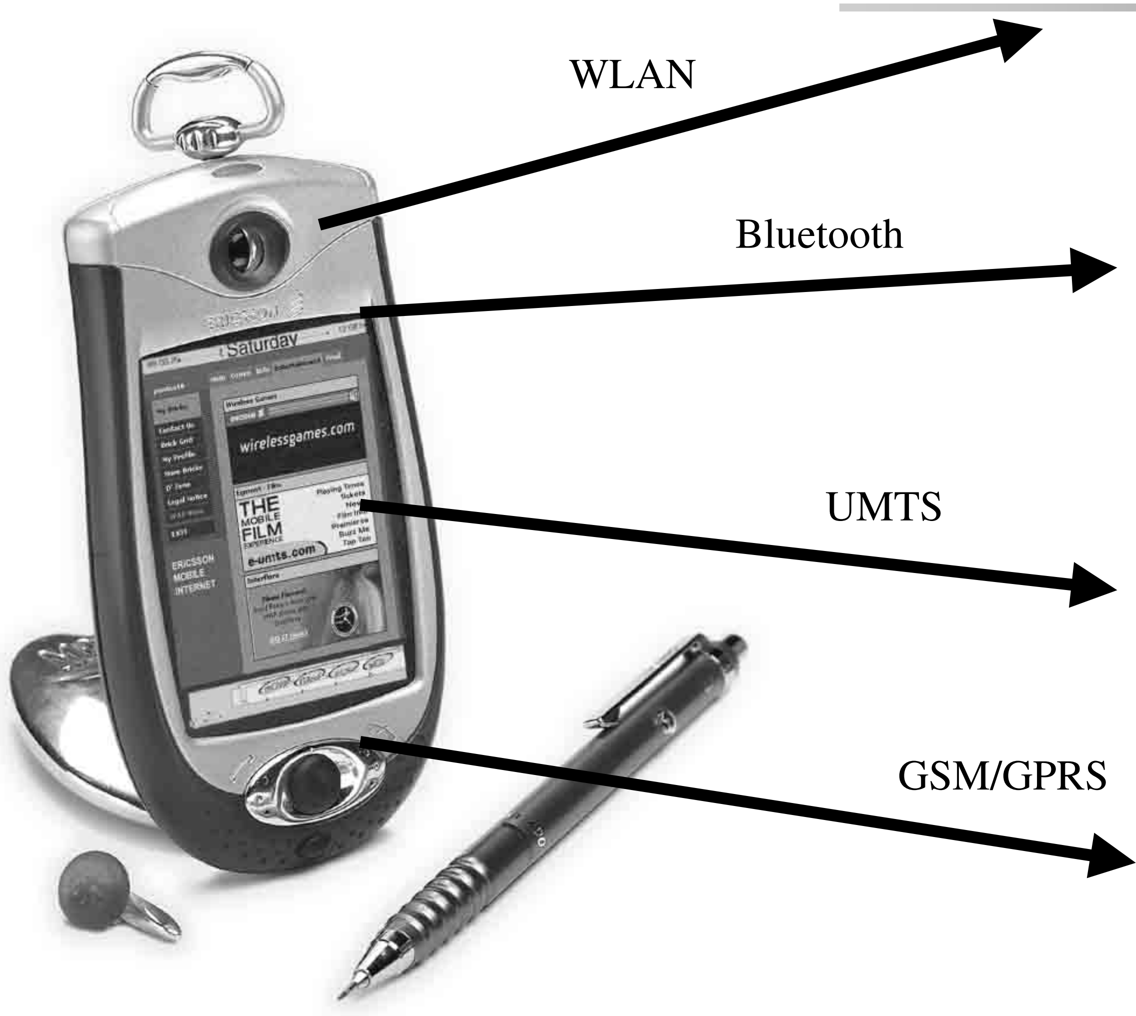
ITS: Intelligent transport system
HAPS: High Altitude Stratospheric Platform



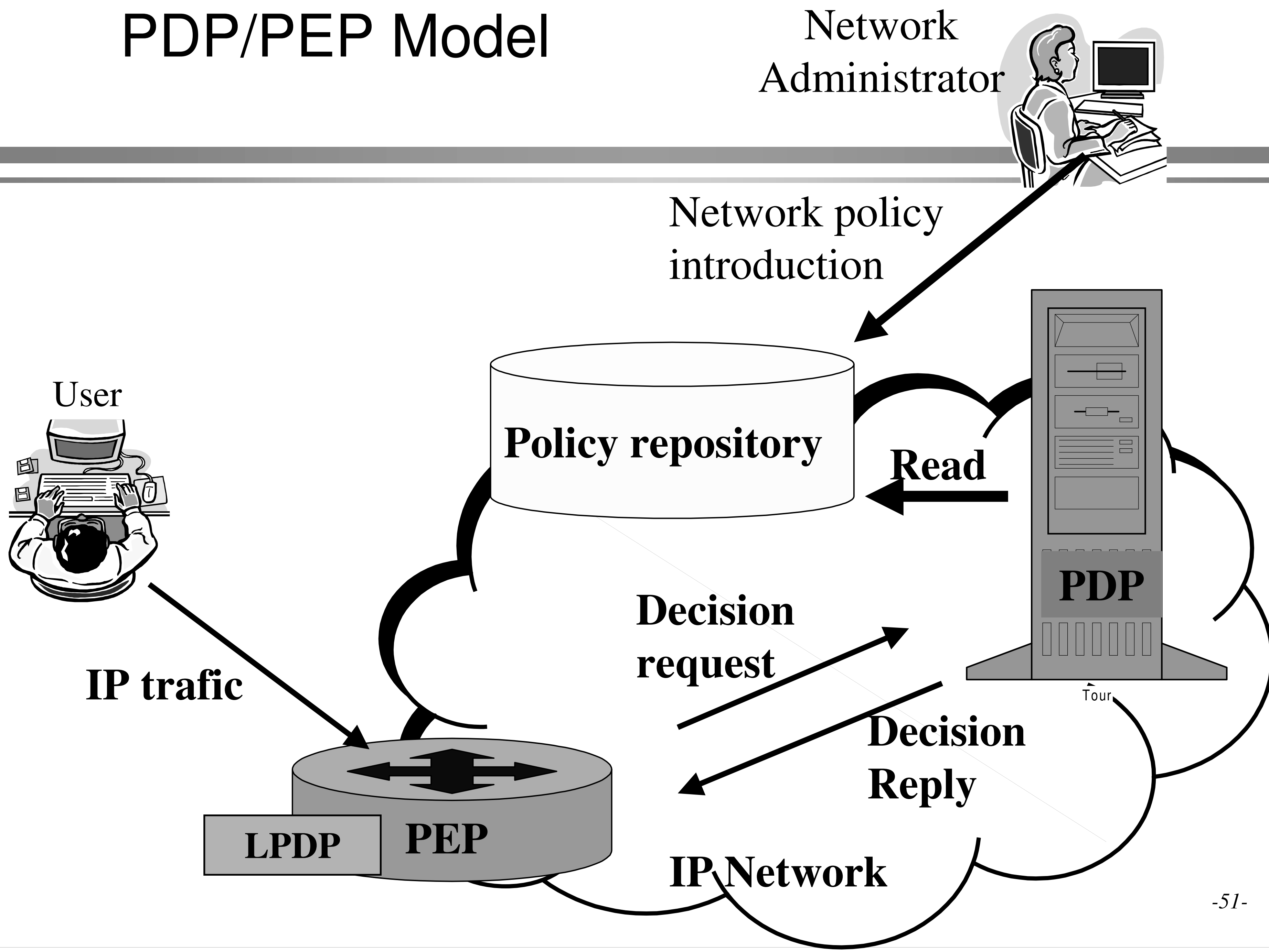
4th generation

- **4è génération**
  - **Heterogeneous handover**
    - ✓ **IEEE 802.11**
    - ✓ **HiperLAN**
    - ✓ **Bluetooth**
    - ✓ **UMTS**
    - ✓ **GPRS**
    - ✓ **GSM**
    - ✓ **Satellite**
    - ✓ **Fixe**
  - **Ad hoc networks**
  - **Mobile router**

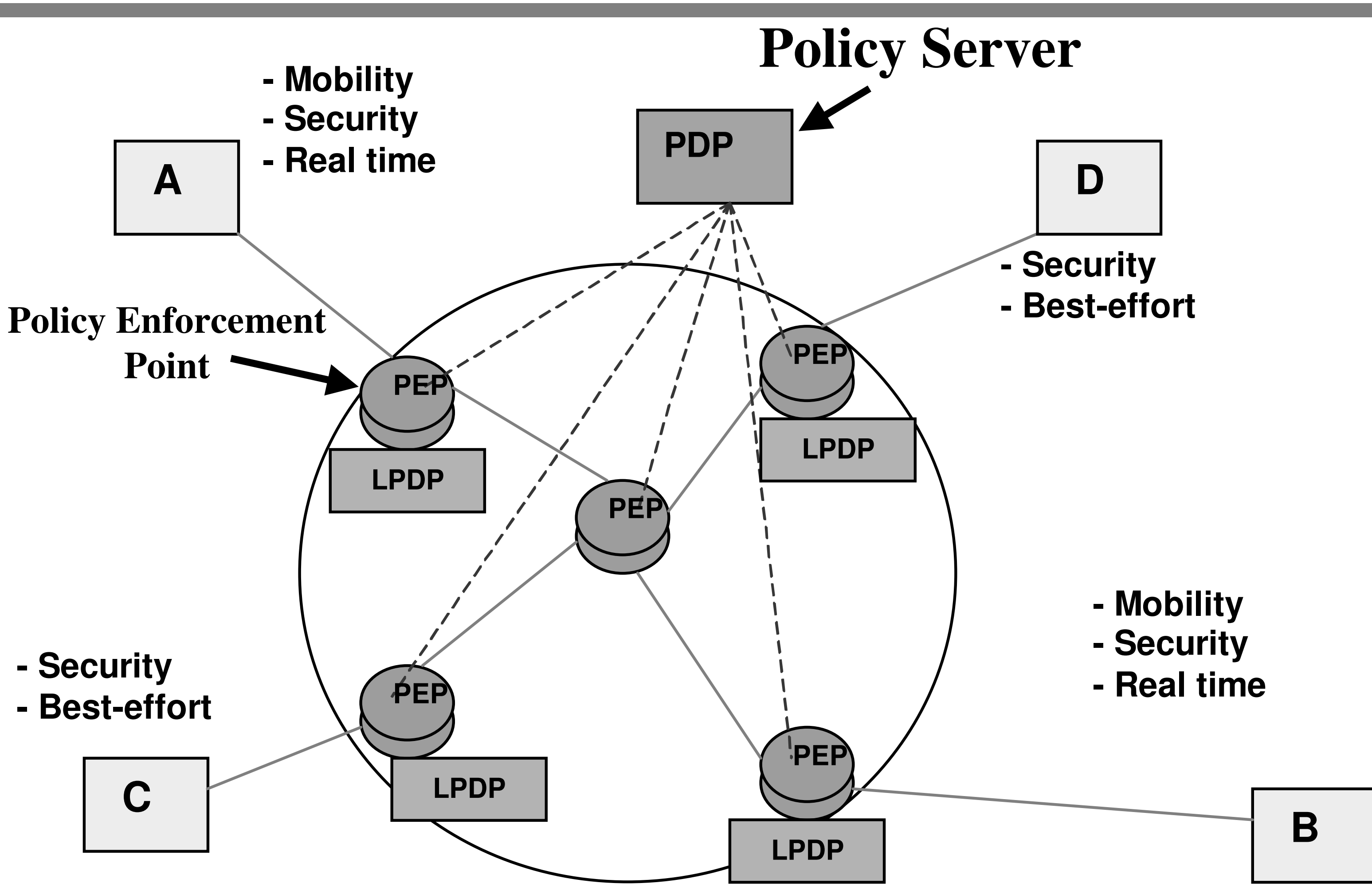
4^{th} generation

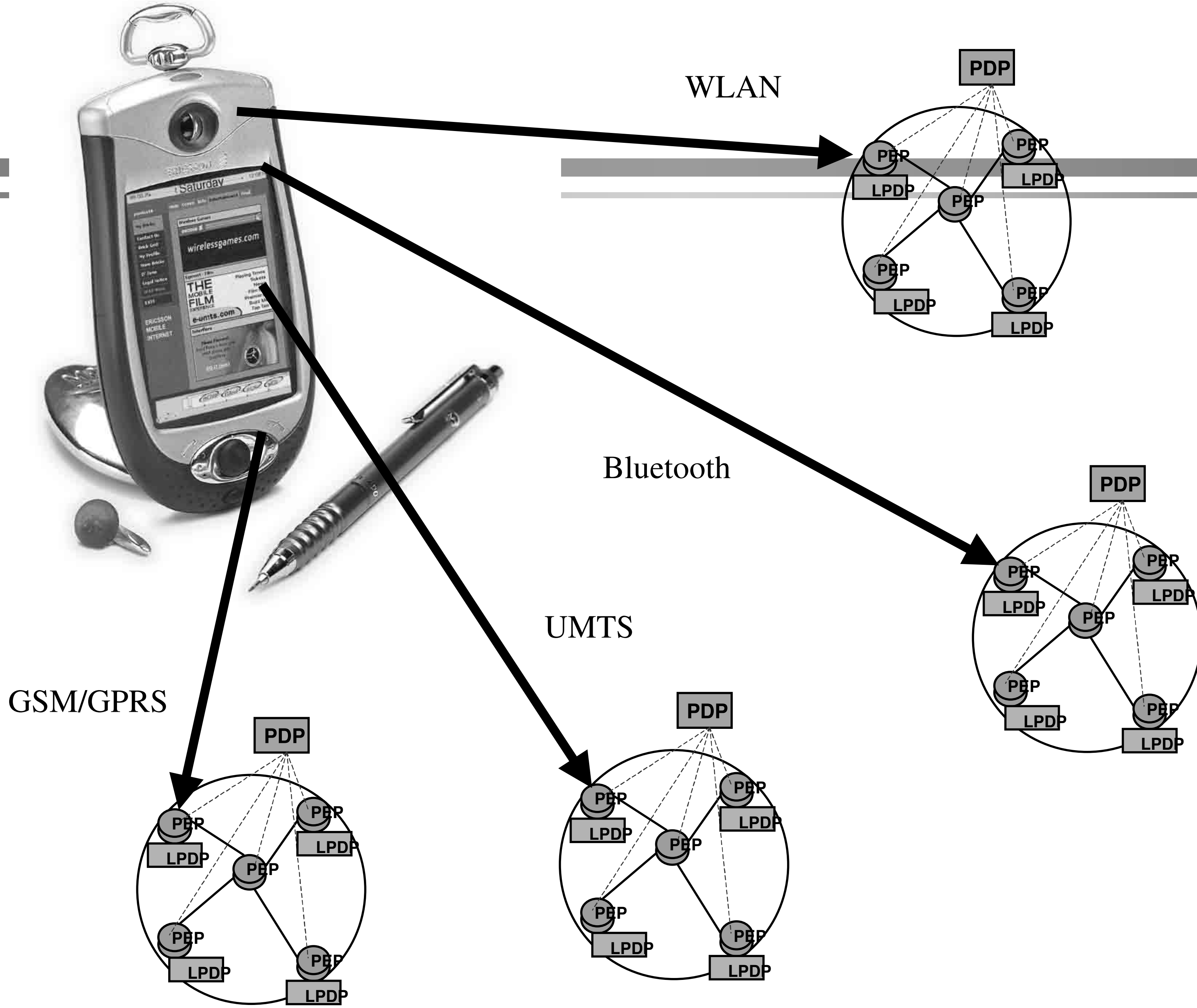


PDP/PEP Model

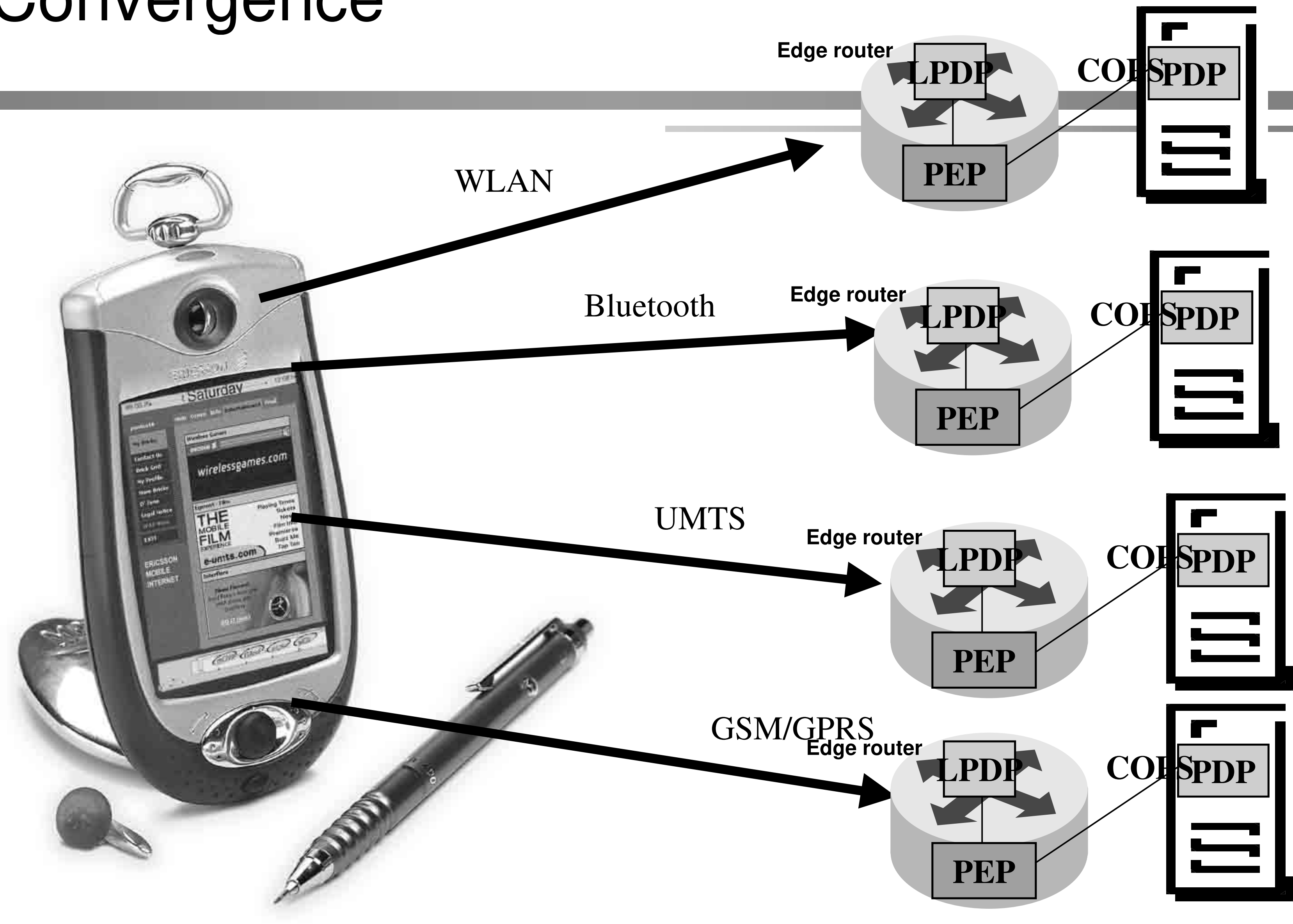


Challenges

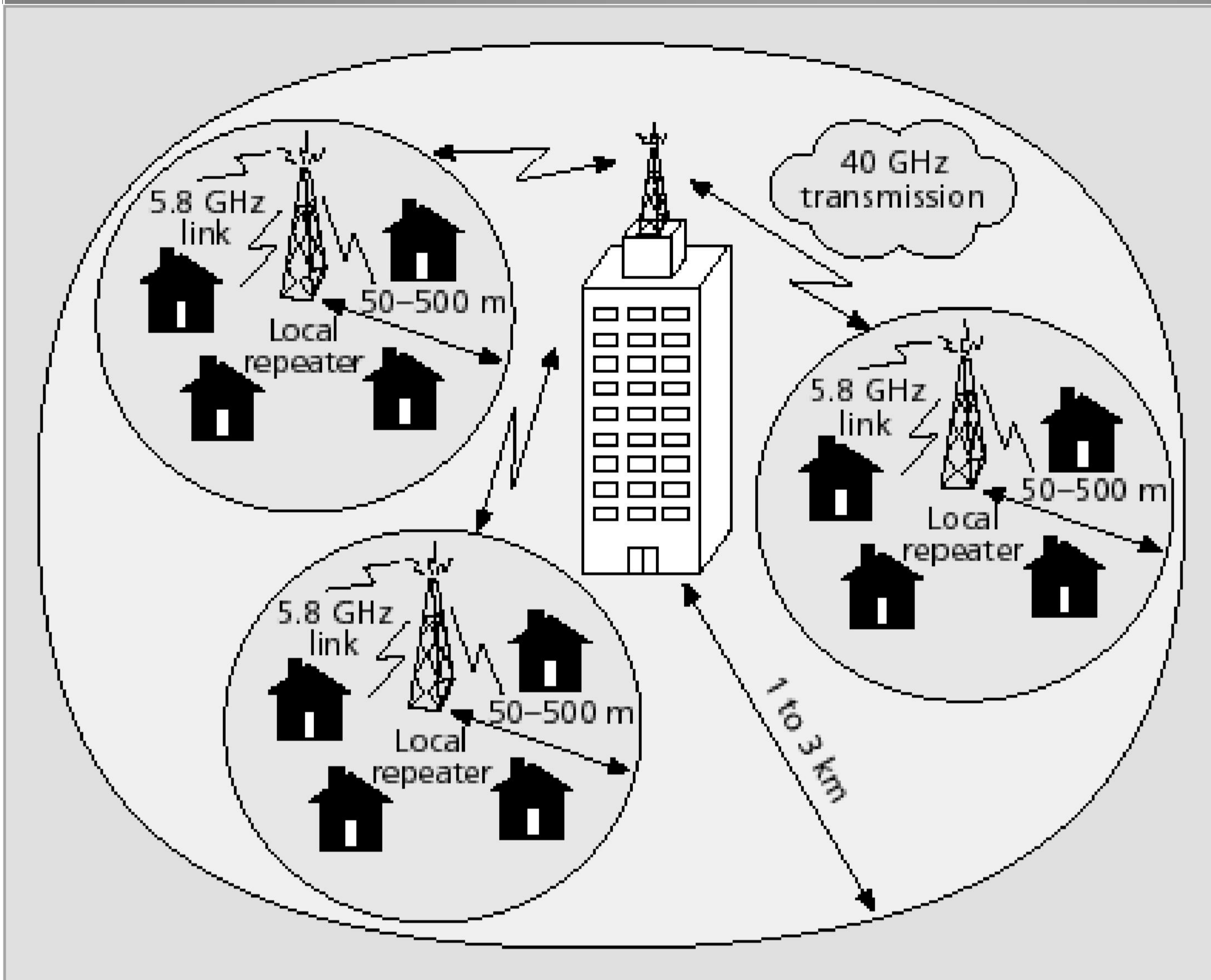

Policy Server
PDP
- Mobility
- Security
- Real time
A
D
- Security
- Best-effort
Policy Enforcement Point
PEP
LPDP
PEP
LPDP
PEP
PEP
LPDP
PEP
LPDP
- Mobility
- Security
- Real time
- Security
- Best-effort
C
B


WLAN
PDP
PEP
LPDP
Bluetooth
UMTS
GSM/GPRS
wirelessgames.com
THE MOBILE FILM
e-umts.com
ERICSSON MOBILE INTERNET
Saturday

Convergence



Embedded Internet



Anywhere
Any time

Free access

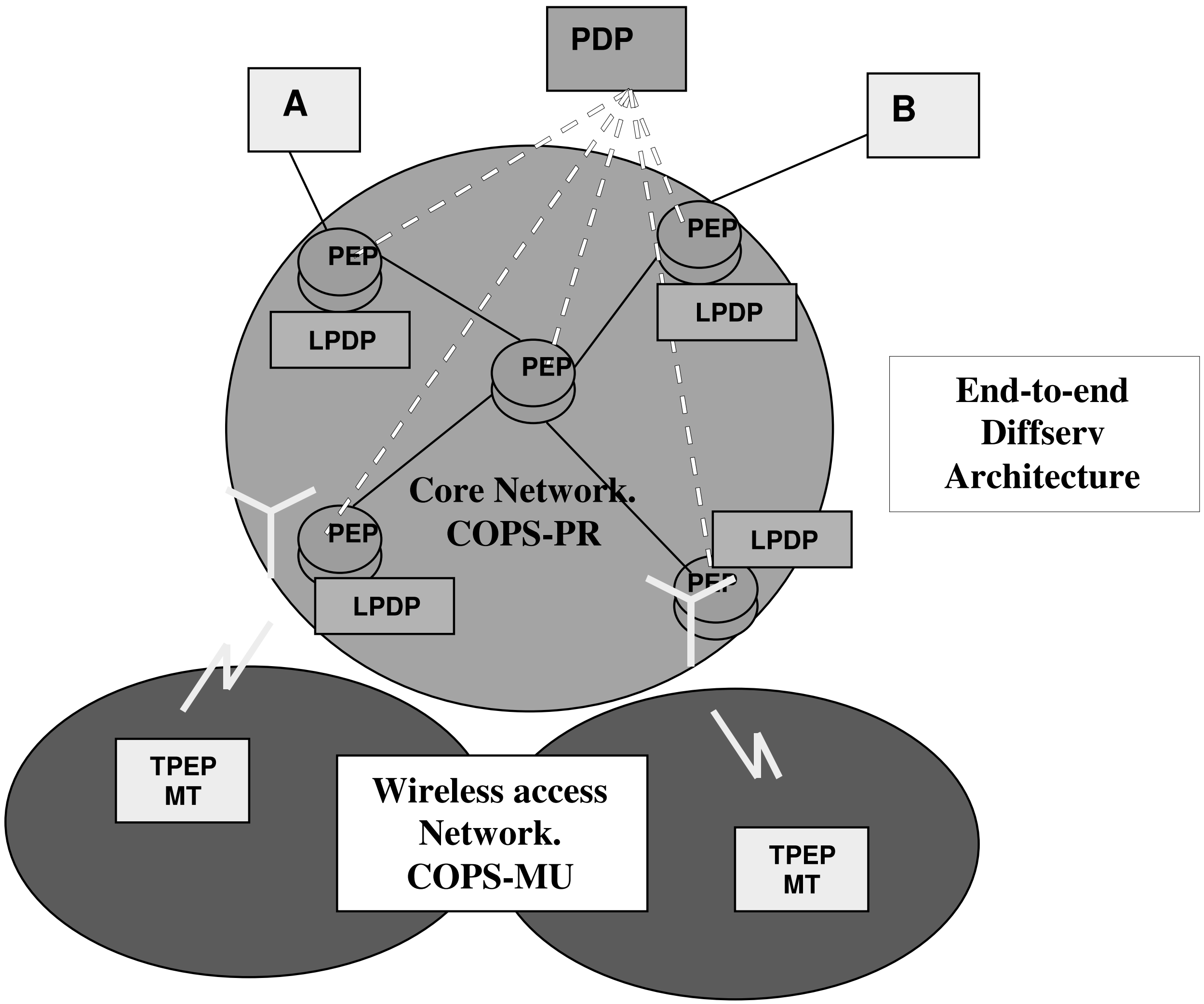
Internet town

IEEE 802.11

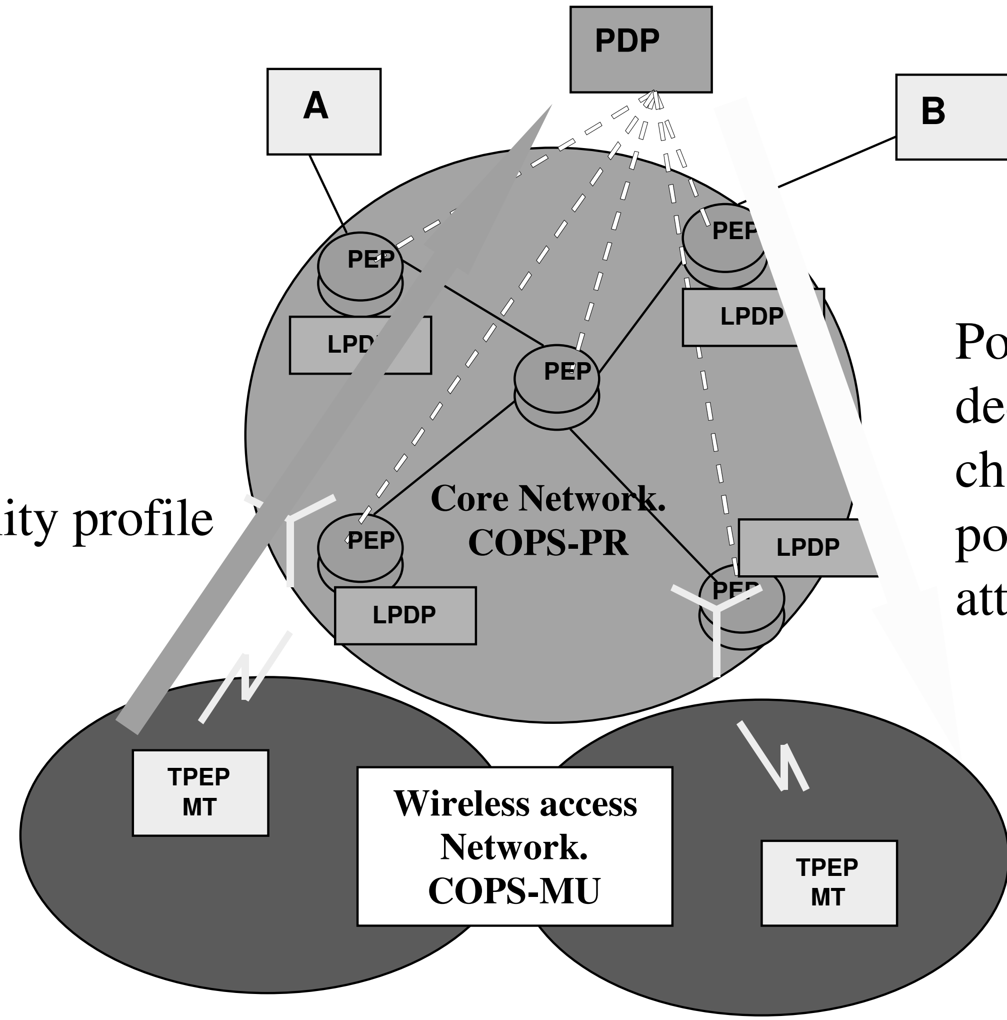
Ambience project
Philips
(20 partners)

COPS-MU QoS architecture

- Mobility
- Security
- Real time
- QoS



COPS-MU based handoff and QoS



Mobility profile

Policy based decision to choose the next point of attachement

Thank you

Questions?