MOBILE TECHNOLOGY TEACH-IN

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BIRD & BIRD

Mobile Technology Teach-in

- Introduction to Mobile Communications
  - 1G, 2G, 3G, Satellite
- The Regulatory Framework
  - UK, Europe, Global
- Radio Spectrum Economics
  - Economic value of the radio spectrum
  - Spectrum pricing and allocation options

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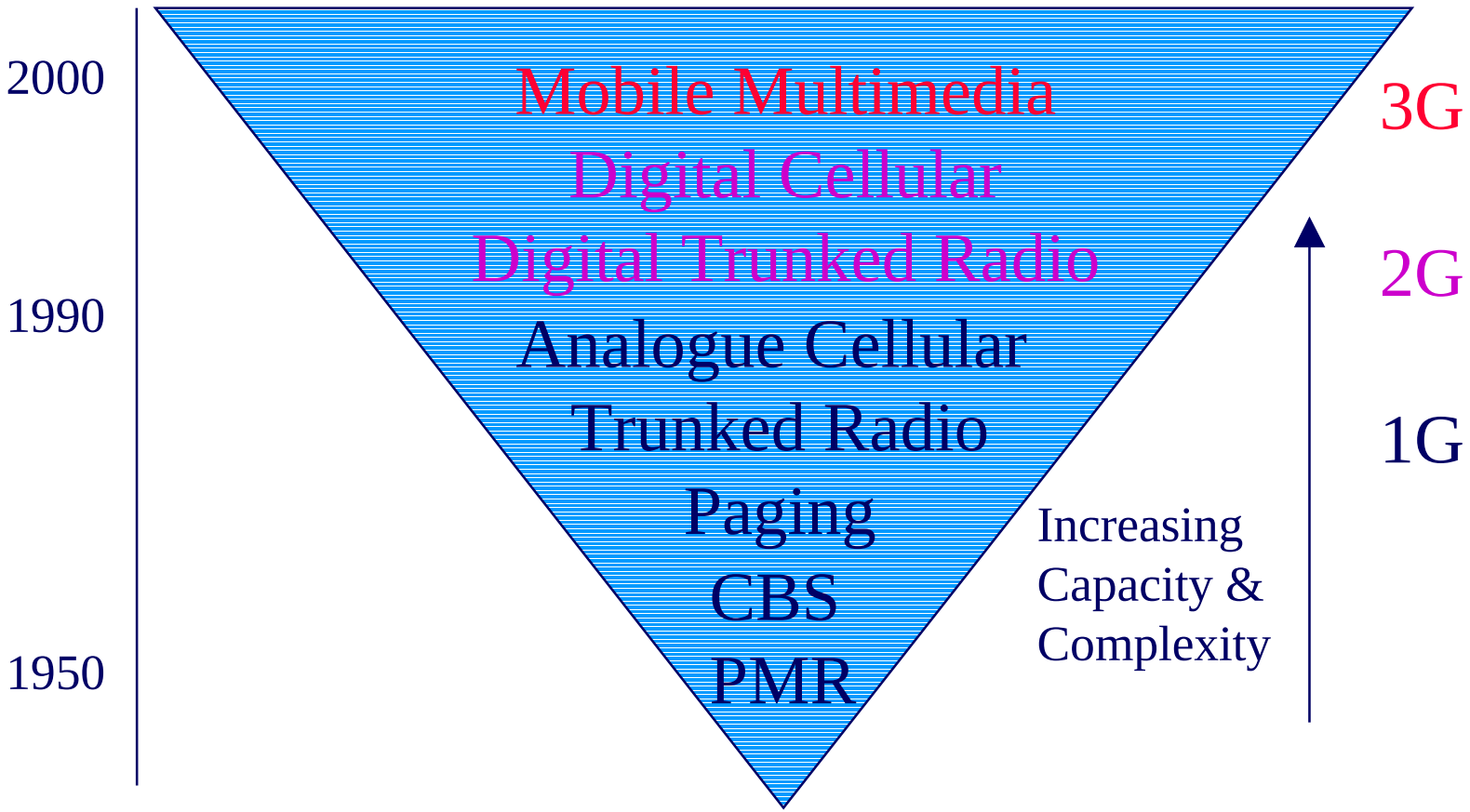
Mobile Services Hierarchy

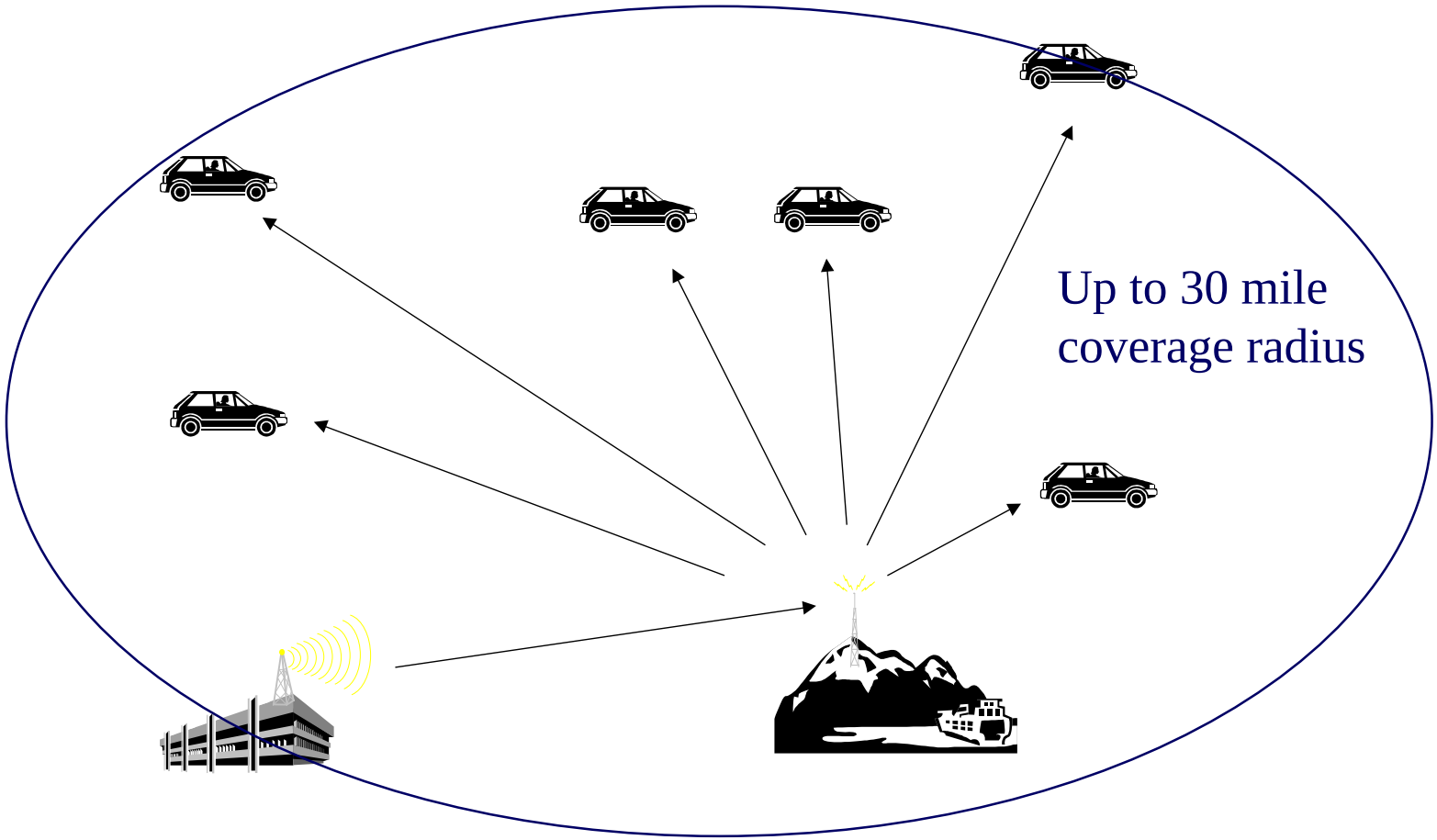


1G: PMR

- Most basic 2-way radio service
- 800,000 UK users (28,000 licences)
- Individual WT Act Licence needed (RA)

  (except for "PMR 446")
- No T Act Licence (class licence applies)
- Main users: Emergency services, Utilities, Fleet Operators, taxis, couriers

Wide Area PMR



Common Base Stations

- Functionally similar to wide area PMR
- Provide subscription services to third parties
- 1300 systems in UK
- WT Act licence needed but no T Act licence
- Users include: Delivery firms, caterers, farmers
- Most basic public mobile service

Trunked Mobile Radio

- Functionally similar to PMR
- Uses **trunking** to increase capacity & efficiency
- Public (PAMR) and Private (PMR) Networks
- circa 100,000 PAMR subscribers in UK
- Widely used by emergency services, utilities, transport operators

Paging

- Simplest and cheapest mobile service
- Delivers messages to receiver terminal
- 4 public networks plus many private systems
- 1.5 million users in UK
- Increasing competition from Cellular (SMS)
- Future lies with 2 way paging and VAS

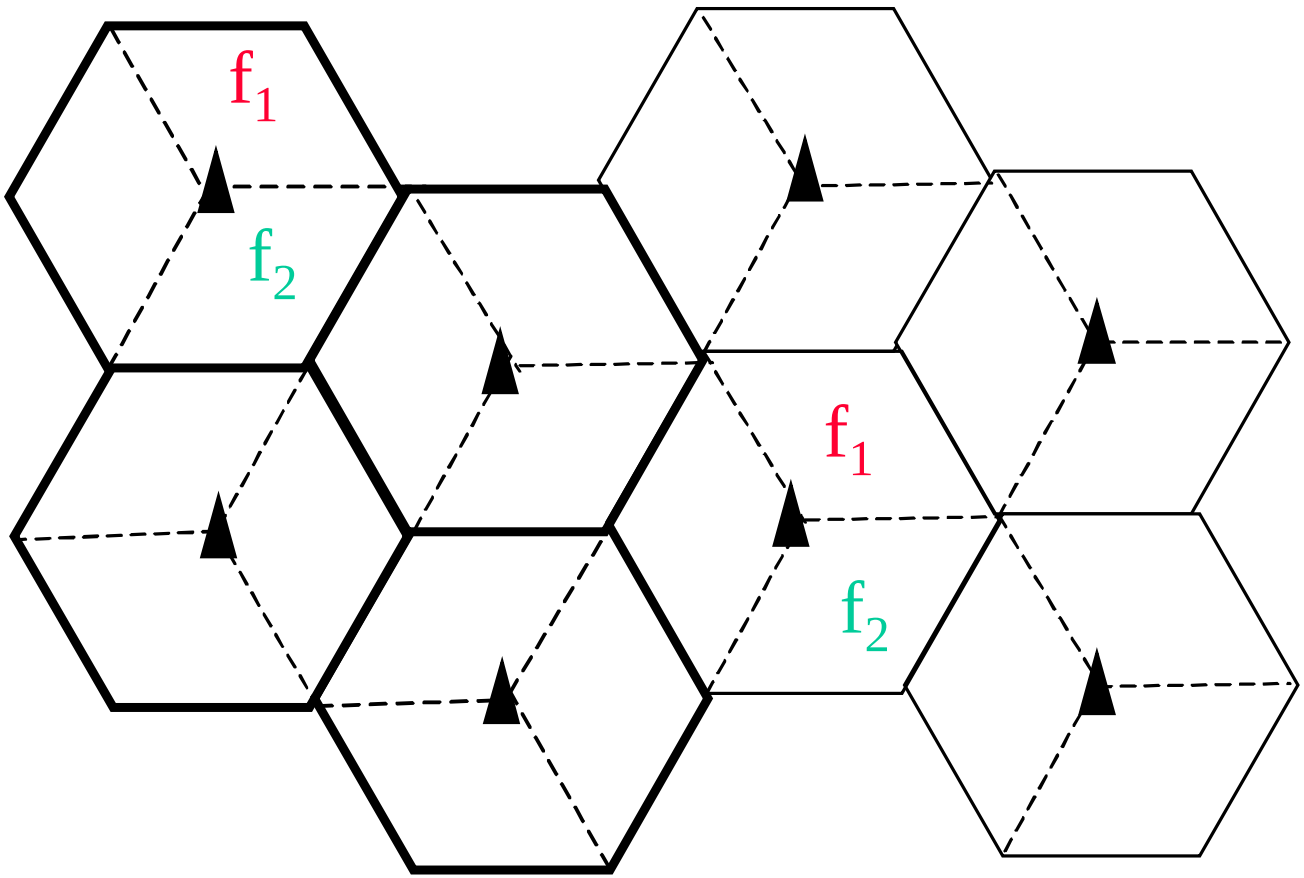
Mobile Data

- Four Public Mobile Data Networks in UK
  - Cognito, RAM, Securicor, Vodafone (Paknet)
- Uses include credit card verification, traffic monitoring, asset tracking
- Increasing competition from cellular mobile data (GSM & 3G)

Cellular Radio

- Provides massive increase in capacity by intensive frequency re-use
- Wide area coverage provided by inter-cell “handover”
- Over 500 million subscribers worldwide
  - two thirds use European GSM standard

Cellular Planning



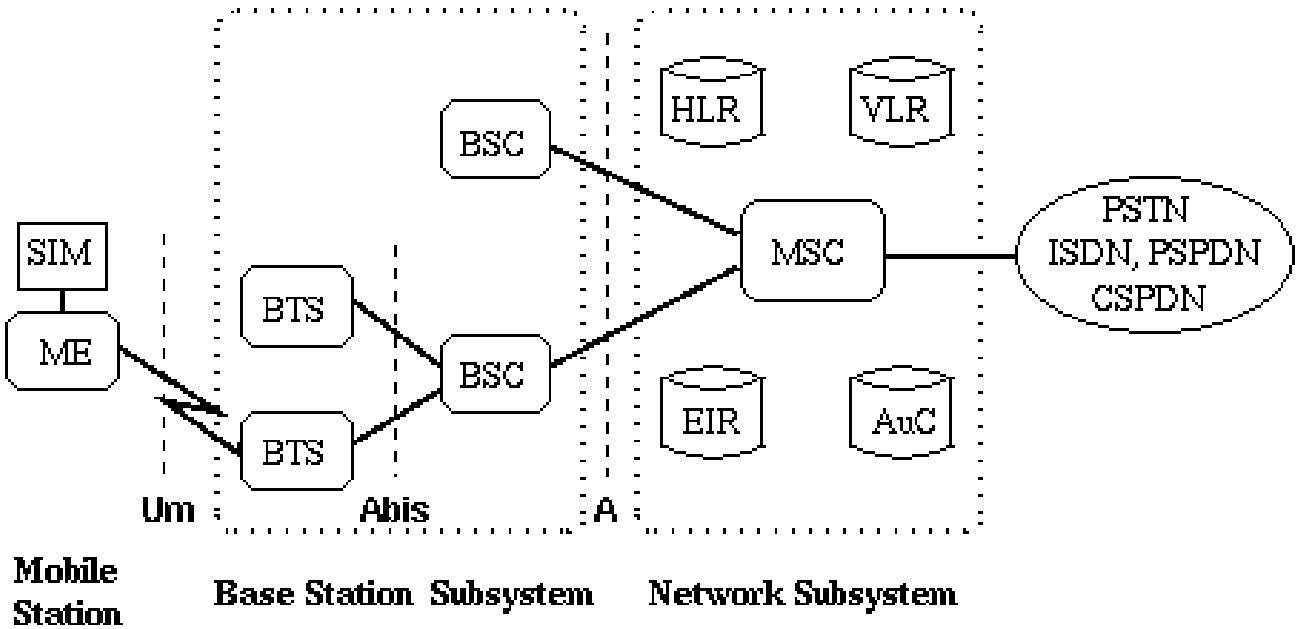
1st Generation Cellular

- Introduced to UK 1984 (Cellnet / Vodafone)
- Different standards & spectrum around world - e.g. NMT, TACS (Europe), AMPS (USA, Japan)
- Voice only
- Prone to Eavesdropping
- Limited capacity and voice quality

2G: GSM

- Open standard - available from ETSI
- 3 Frequency bands
  - 1900 MHz (Americas)
  - 900 / 1800 MHz (rest of world)
- Voice, fax, data, short messaging
- Encrypted - secure voice & data transmission
- Enhancements underway - “2.5 G”

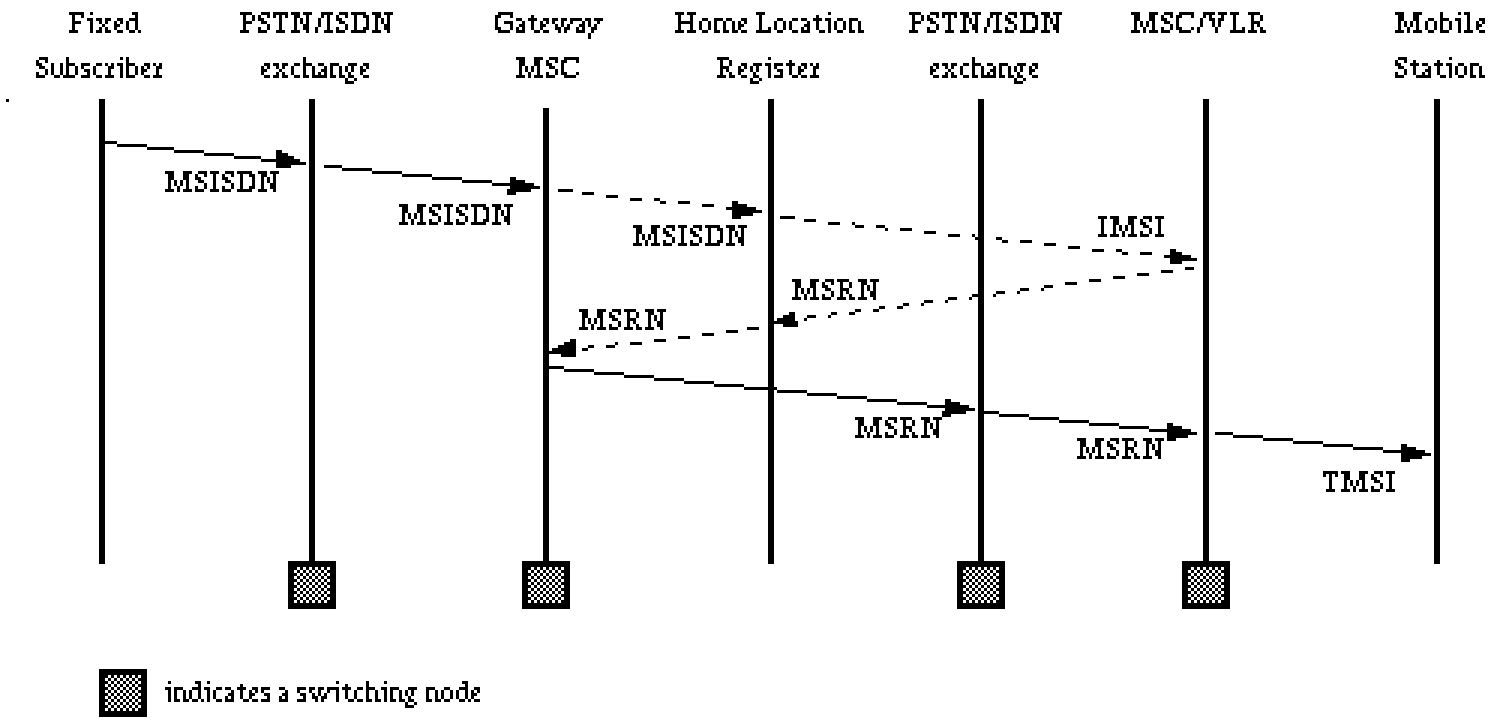
GSM Networks



SIM Subscriber Identity Module
ME Mobile Equipment
BTS Base Transceiver Station
BSC Base Station Controller
HLR Home Location Register
VLR Visitor Location Register
MSC Mobile services Switching Center
EIR Equipment Identity Register
AuC Authentication Center

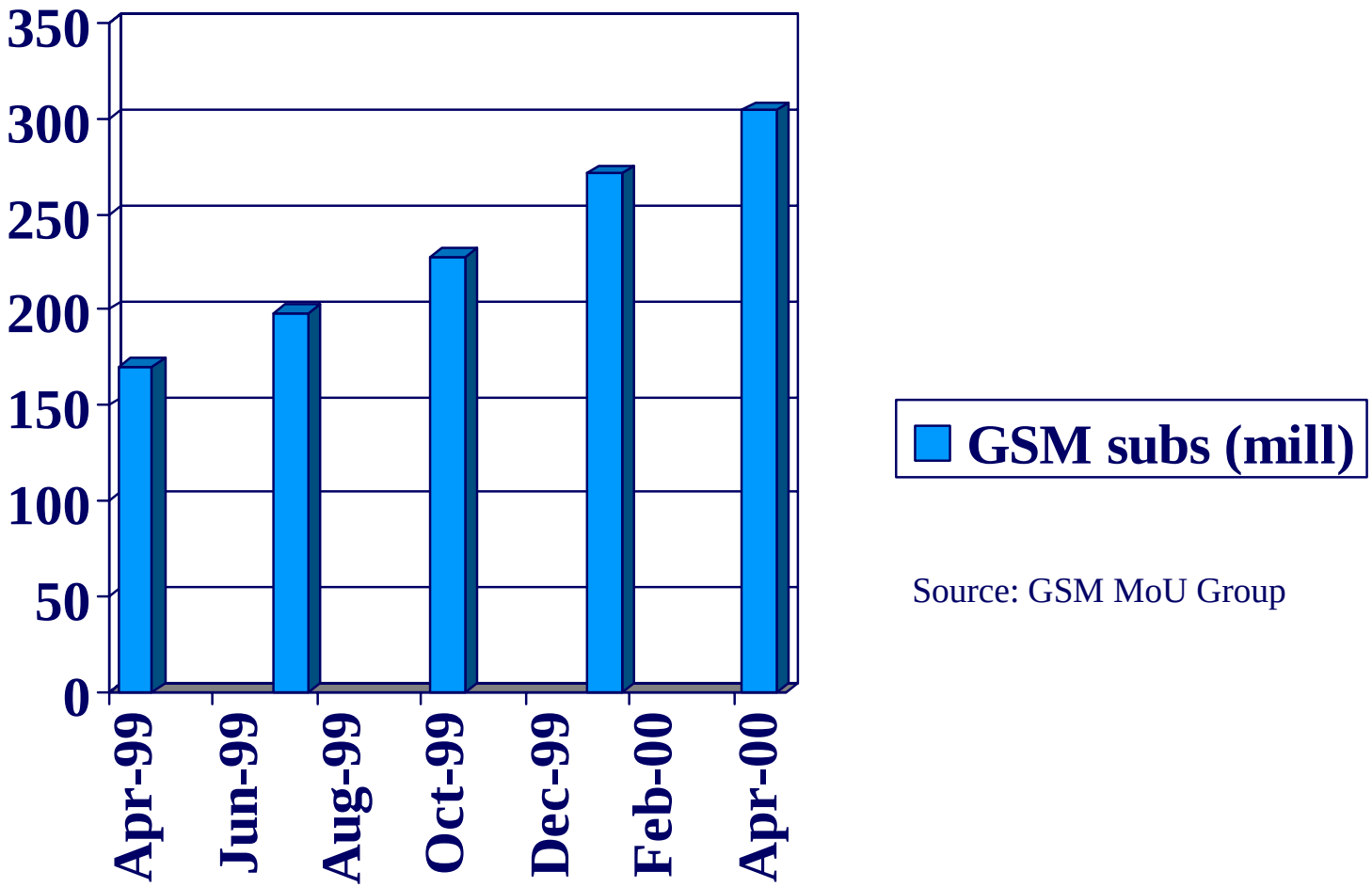
Source: John Scourias. Reproduced by permission

GSM Call Routing



Source: John Scourias. Reproduced by permission

Cellular Growth



Source: GSM MoU Group

2G: TETRA

- **Te**rrestrial **T**runked **R**adio
- Digital Trunked Mobile Radio standard
- Combines PMR and Cellular functionality
- Used by Dolphin and the new Public Safety Radiocommunications Network
- Networks rolling out across Europe

Mobile Satellites

- Provide mobile voice / data on a global basis
- Generally combined with terrestrial access
- Voice, fax,, e-mail - comparable to GSM
- Future market uncertain
  - Failure of Iridium
  - Increasing ubiquity of terrestrial cellular
  - Competition from fixed sat (e.g. Inmarsat)

Mobile Satellites

- Global Roaming main target market
- May also find niche in developing world
  - e.g. rural payphones
- Potential growth in maritime / aeronautical sectors
- Services provided via local SPs and international gateway stations
  - movie

Mobile Charging and Tariffs

- Many tariff options
  - Post-pay, pre-pay
  - Usage based, flat rate
  - Caller pays or called party pays
  - Duration or event based (circuit vs packet)
- Gradual erosion of average revenue
- Increasing emphasis on VAS & content

International Regulatory Framework

- Global
  - ITU-R, ITU-T, World Radio Conferences
- Regional (Europe)
  - CEPT, ETSI, European Commission
- National
  - DTI (CII), RA, Oftel

European Regulatory Framework

- CEPT / ERC
  - Responsible for frequency planning, spectrum engineering and radio regulation in 44 EU and former Eastern Bloc countries
- ETSI
  - Develops standards for radio and telecomms
- European Commission
  - Overall regulatory framework

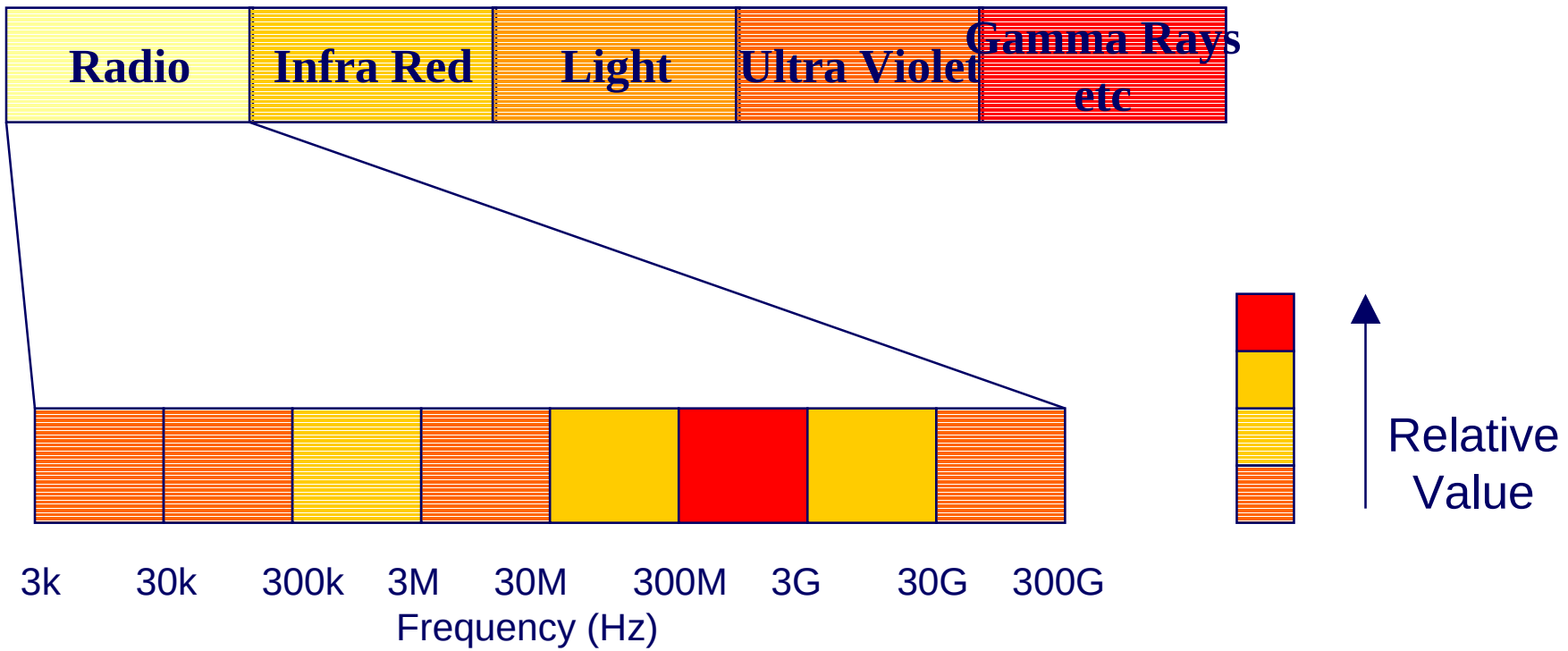
Recent EC Activities

- Satellite PCS Decision (710/97/EC)
- Licensing Directive (97/13/EC)
- UMTS Decision (128/1999/EC)
- 1998: Green Paper on Spectrum
- 2000: Common Regulatory Framework Proposals

WRC 2000

- Additional Spectrum for 3rd Generation agreed
  - 900 MHz, 1800 MHz and 2600 MHz
- Global allocations
  - But can be made available as required on a national basis
- Full results available via ITU web site
  - **http://www.itu.int/newsroom/press/releases/2000/13.html**

The Radio Spectrum



Spectrum Economics

- Radio's contribution to the UK economy
  - Direct GDP contribution: £19 Bn (c. 2%)
- Employment
  - > 500,000
- Estimated efficiency gains for users
  - c. £20 Bn p.a.
- Further studies underway by RA and other NRAs

Spectrum Economics

- Spectrum Auctions & Pricing
  - £22.5M in UK (auction), FRF130M in France (beauty contest)
  - Increasing recognition of true value of spectrum
- Global Players
  - Vodafone 4th biggest company by market cap.
  - Microsoft, Oracle, Cisco and others increasingly focussing on wireless and mobile

Further Information (1)

- Mobile Trade Associations
  - Federation of Communication Services
    www.fcs.org.UK
  - Federation of Electronics Industries
    www.fei.org.UK
- Standards Bodies
  - ETSI **www.etsi.org**
  - 3GPP **www.3gpp.org**

Further Information (2)

- Regulators:
  - Radiocommunications Agency **www.radio.gov.uk**
  - Oftel **www.oftel.gov.uk**
  - DTI **www.dti.gov.uk/cii/index.html**
  - CEPT **www.cept.org**
  - ITU **www.itu.int**

Further Information (3)

- GSM
  - John Scourias technical paper
    http://ccnga.uwaterloo.ca/~jscouria/GSM/gsmreport.html#3
  - GSM MoU Group **www.gsmworld.com**
- 3rd Generation
  - 3rd Generation Partnership Project **www.3gpp.org**
  - UMTS Forum **www.umts-forum.org**

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