Evolution of Spectrum Management: New Frontiers

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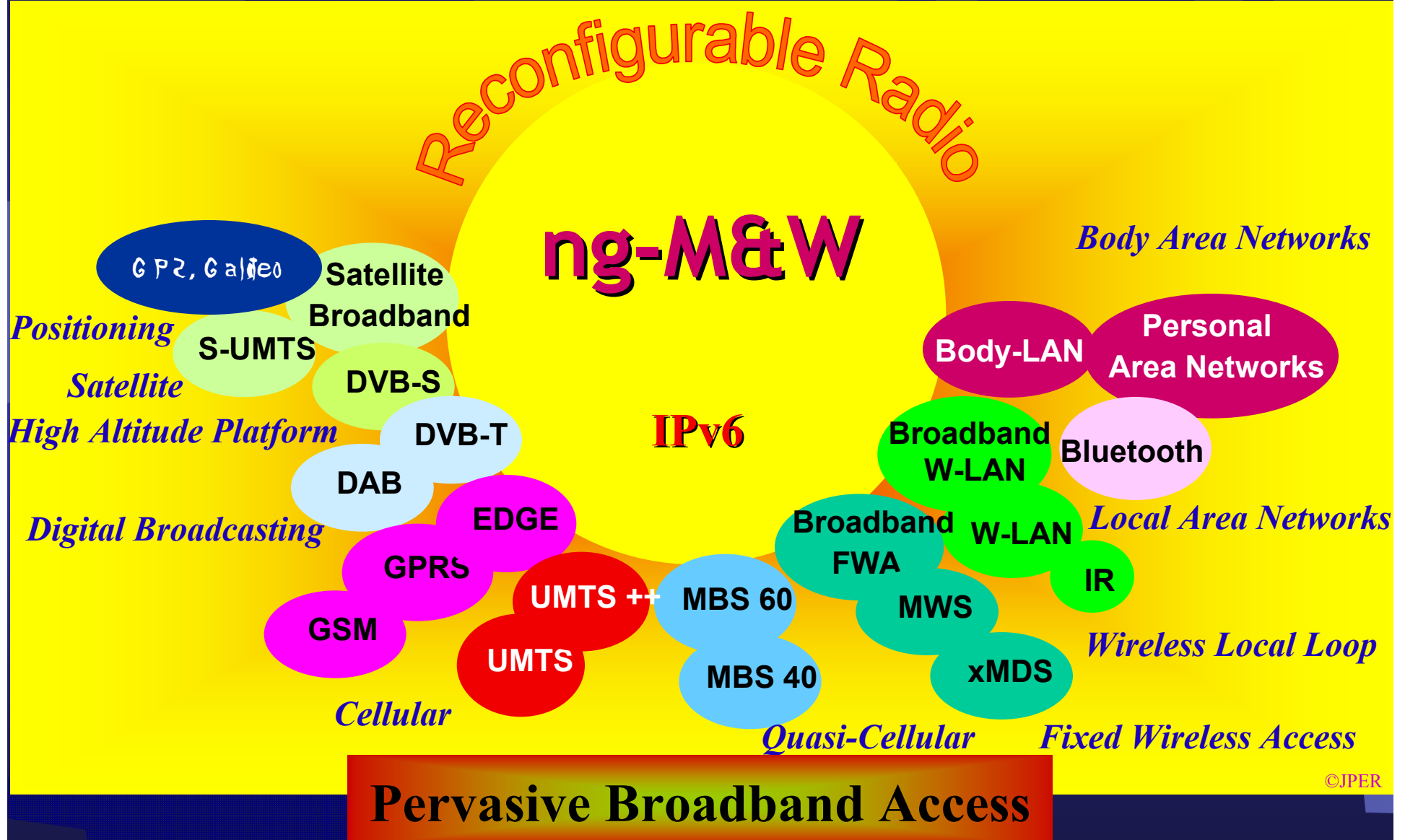European Commission

Information Society

Ubiquitous Wireless Access over/across Heterogeneous Networks

integrating

Public and Private,

Licensed and Unlicensed

It is all about Integration...

Reconfigurable Radio

ng-M&W

IPv6

GPS, Galileo

Positioning

Satellite Broadband
S-UMTS
Satellite

DVB-S

High Altitude Platform

DVB-T

DAB

Digital Broadcasting

EDGE

GPRS

GSM

Cellular

UMTS ++

UMTS

MBS 60

MBS 40

Quasi-Cellular

Body Area Networks

Body-LAN

Personal Area Networks

Bluetooth

Broadband W-LAN

W-LAN

Local Area Networks

Broadband FWA

MWS

IR

xMDS

Wireless Local Loop

Fixed Wireless Access

©JPER

Pervasive Broadband Access

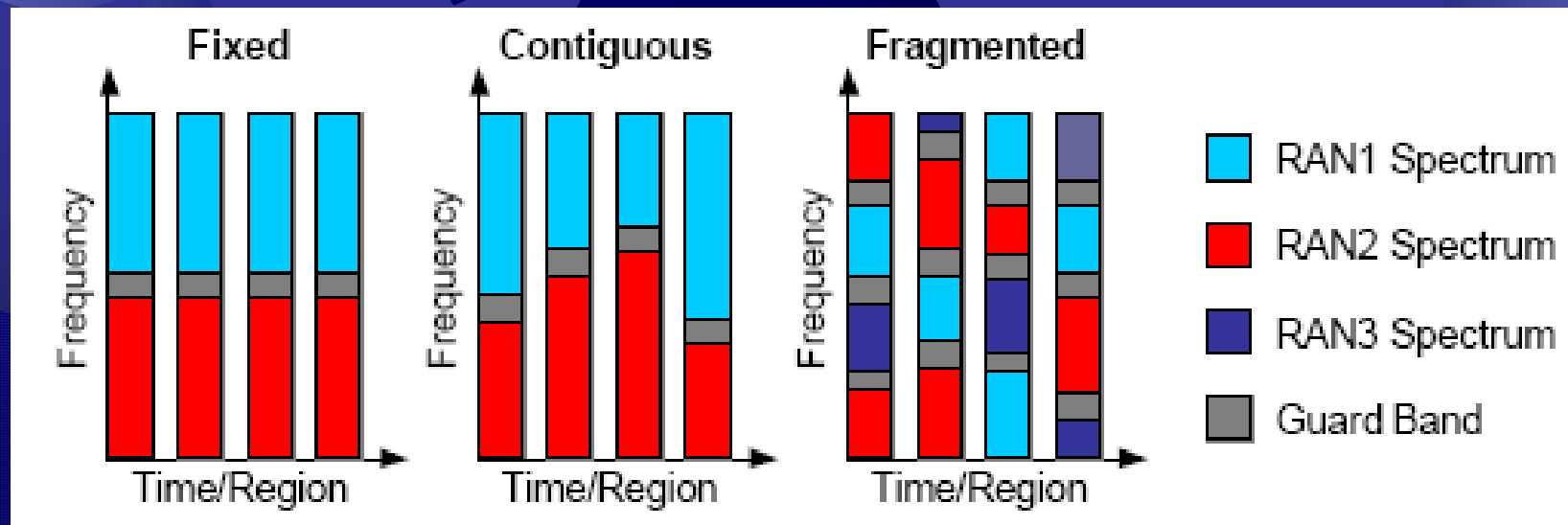# Two key principles

- Technology Neutrality

Next...

- Service Neutrality

Analogue Turn-off

- **Using spectrum made free by analogue turn-off**
  - planned in Europe for 2006-2012
    - The Commission expects the transition to digital to be well advanced by 2010 and proposes a deadline of early 2012 for phasing out analogue terrestrial broadcasting
    - The Commission also calls for a co-ordinated approach to making freed-up spectrum available across the EU
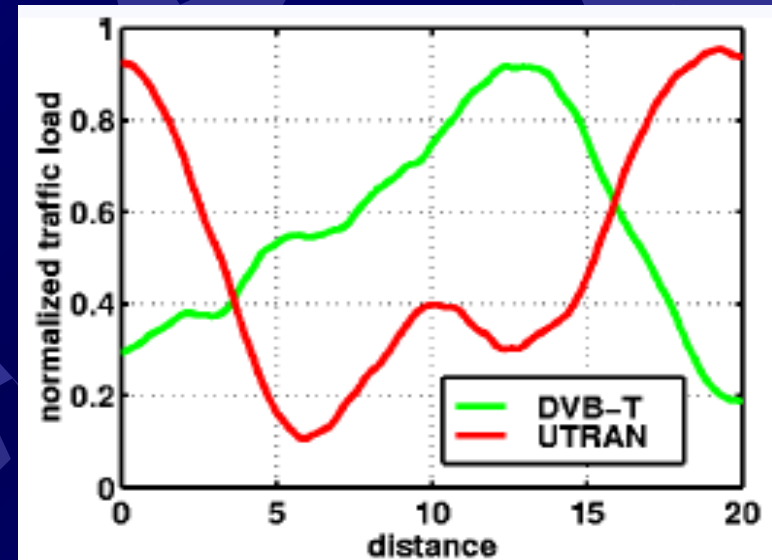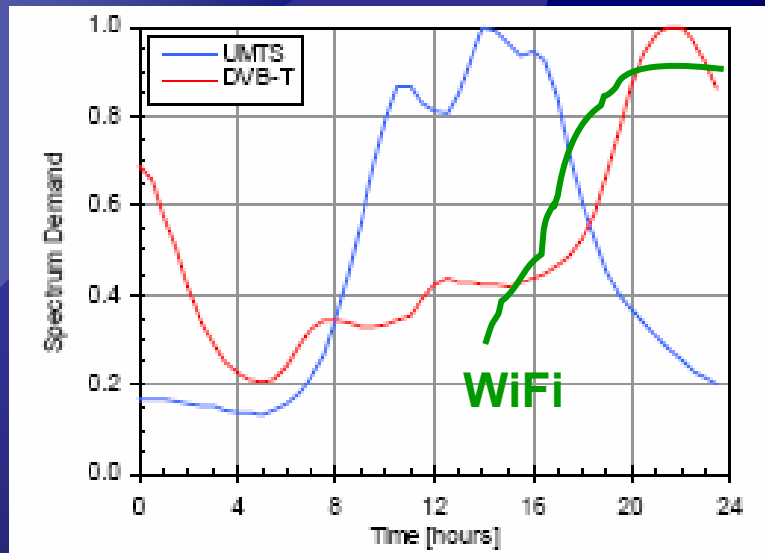 - to end in the US in Feb. 17, 2009

Evolution of spectrum allocation schemes from DRiVE to OverDRiVE

- **DRiVE (2000-02)** inter-working of different radio systems (GSM/GPRS, UMTS, DAB, DVB-T) with Dynamic Spectrum Allocation (DSA).

- **OverDRiVE (2002-04)** - spectrum sharing between systems using DSA according to the actual load as a function of **region** and **time-of-day**.

Time- and Regionally varying traffic patterns
for voice and broadcasting services

From
Software-Defined Radio
to
Reconfigurable Radio Systems and Networks
to
Cognitive Radio
to
Cognitive Networks
towards
Dynamic Spectrum Management

Cognitive Challenges

- Context assessment in a heterogeneous environment
  - Interference Temperature or other relevant metrics for decision making
- Distributed decision making (especially in the case of network-assisted/directed system instantiation) in many cases in absence of complete feedback information
  - non-reciprocal systems
  - Tx/Rc affected locally and/or independently
  - overhead