# IMT-2000 Radio Access Systems

FDMA-TDMA

The Digital Enhanced Cordless Communication (DECT)

# Contents

- DECT an IMT-2000 member
- DECT history
- DECT properties
- DECT Business Case

# Who we are

- A Swiss Capital Equity Holdings (SCEH) company

- Our focus: Consumer Communications equipment

- Our current products: Voice and converged (voice&data) terminals utilizing technologies like DECT, ISDN, PSTN, IP, USB, IrDA, BT, etc.

# Points of contact

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- ⌘ DECT Forum
  - ☑ secretariat@dect.ch
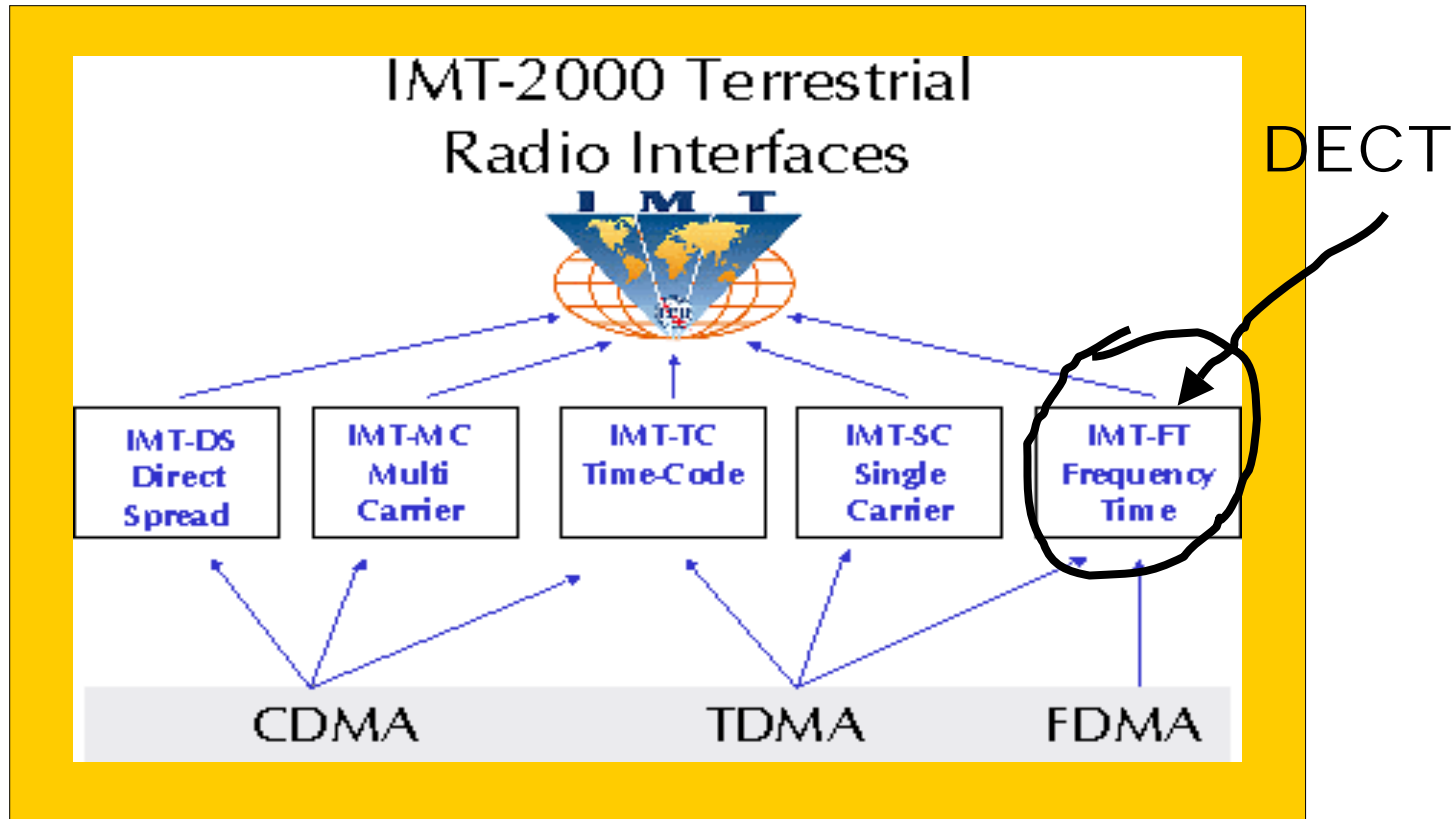  - ☑ http://www.dectweb.com/dectforum/
- ⌘ ETSI Project (EP) DECT
  - ☑ http://webapp.etsi.org/tbhomepage/TBDetails.asp?TB_ID=19&TB_NAME=DECT

# DECT
# an IMT-2000 member

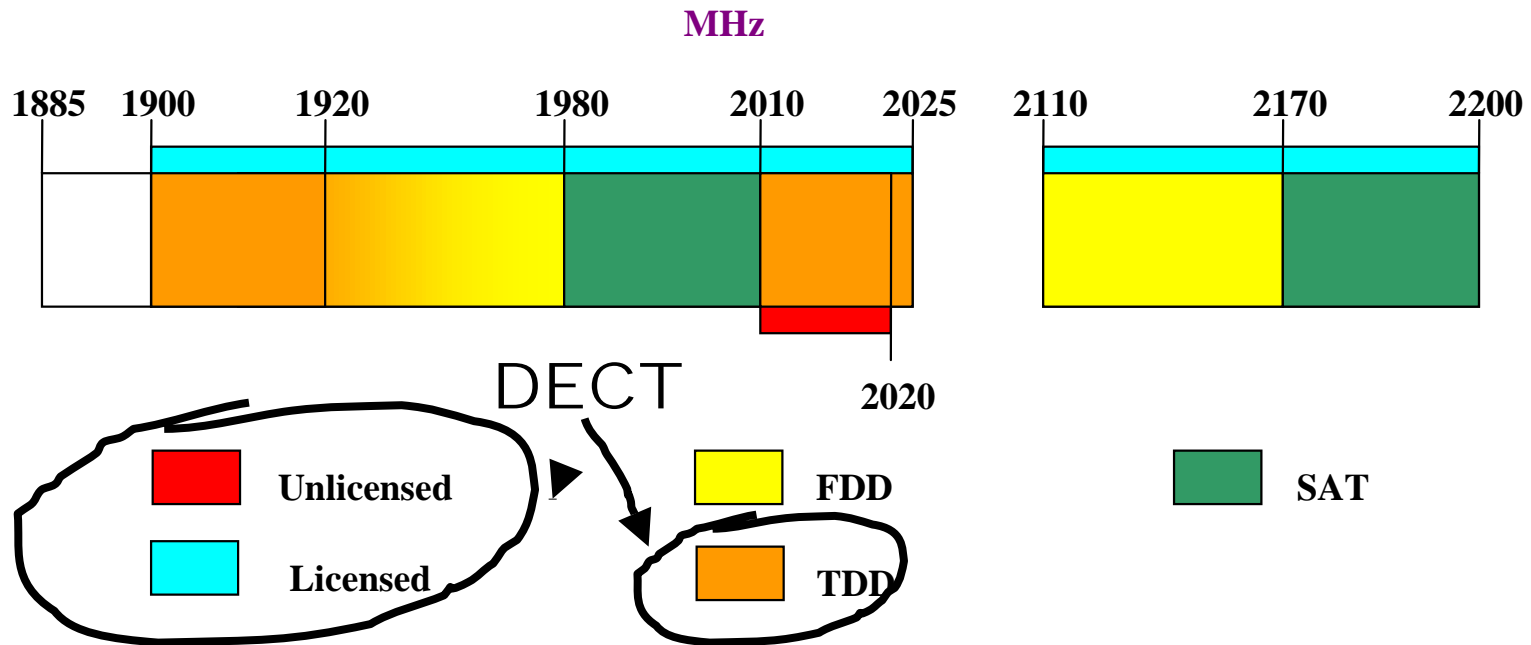# DECT and the IMT-2000 family



DECT

IMT-2000 Terrestrial
Radio Interfaces

| IMT-DS Direct Spread | IMT-MC Multi Carrier | IMT-TC Time-Code | IMT-SC Single Carrier | IMT-FT Frequency Time |

CDMA          TDMA          FDMA

# DECT IMT-2000 domain
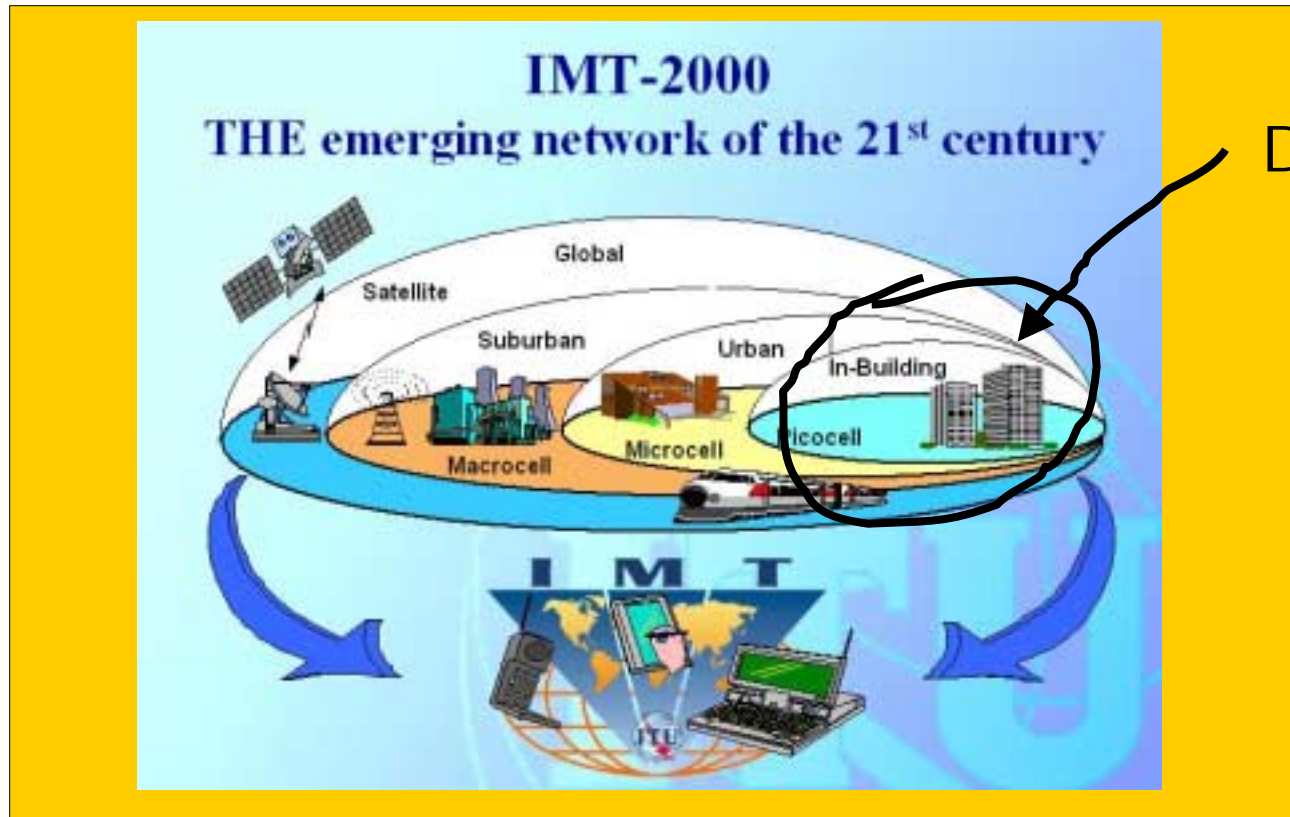


DECT

# DECT IMT-2000 frequency Europe

**MHz**



DECT

| | Unlicensed | | | FDD | | | SAT |
|---|---|---|---|---|---|---|---|
| | Licensed | | | TDD | | | |

**ERC/DEC/(00)01:** "These frequency bands should be made available by 1 January 2002, subject to geographically spread market demand and national licensing schemes to all IMT-2000 members"
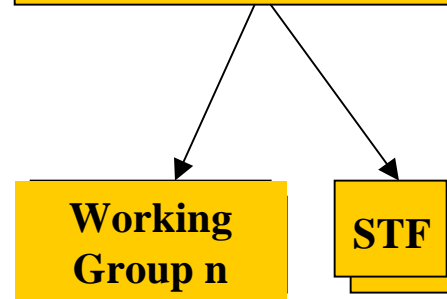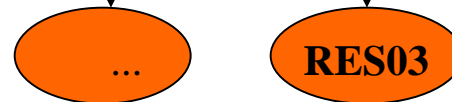
# DECT history

# DECT Parents (standards)

DECT standardisation started 1989

**Contributors since:**
Adherent, Alcatel, Ascom, Bosch, BT, Canon, CorTec, CSELT, Dosch&Amand, Deutsche Telecom, Ericsson, France Telecom, Hagenuk, Italtel, Lucent, Motorola, National Semiconductors, Nokia, Nortel, Olivetti, Philips, R&S, RTX, S3, Siemens, Sigos, Simbyonlics, Telecom Italia, Tele Denmark, Telia, VLSI, … many others
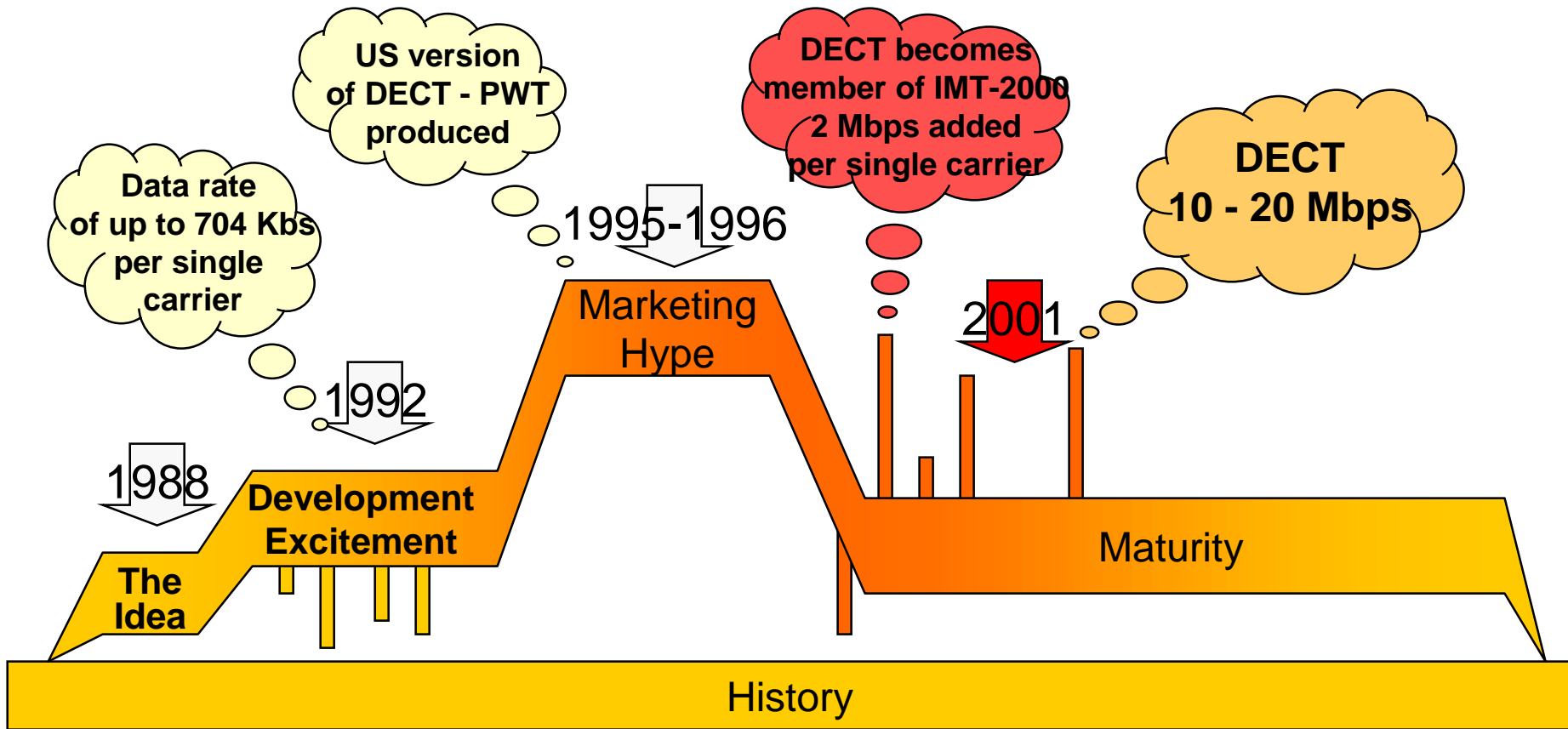


**ETSI**

**...**   **RES03**

**EP DECT**

**Working Group n**   **STF**

**In US**

# DECT Parents (industry)

# DECT Life cycle



Data rate of up to 704 Kbs per single carrier

US version of DECT - PWT produced

DECT becomes member of IMT-2000 2 Mbps added per single carrier

DECT 10 - 20 Mbps

1995-1996

Marketing Hype

1992

2001

1988

Development Excitement

The Idea

Maturity

History

# DECT Birth Certificate

## 1992

**DECT Base Standard published**

ETS(EN) 300 175: DECT Common Interface (8 parts)

| Excellent Voice | Powerful Data | Rich Services | Reliable Security |
|---|---|---|---|
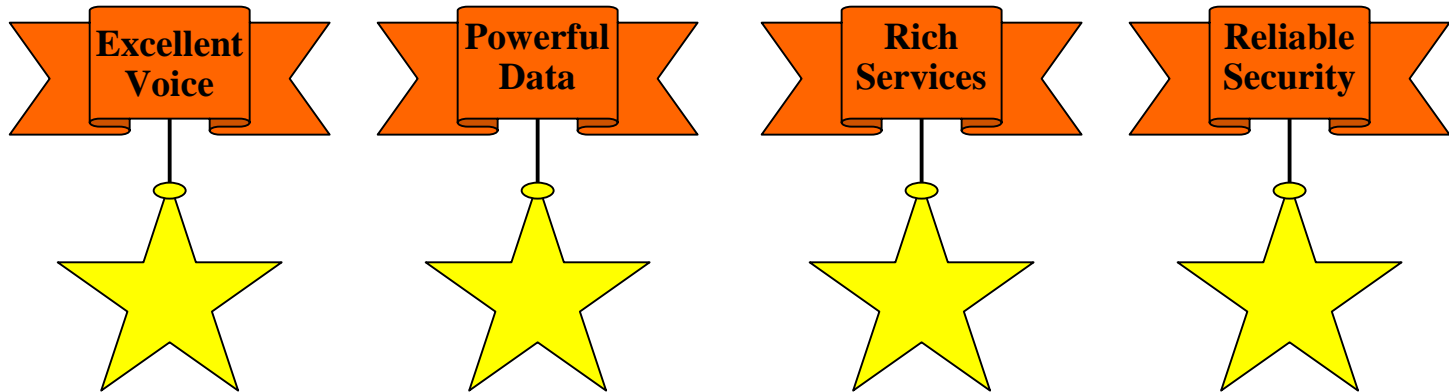
# DECT rebirth

## 1999

DECT becomes member of IMT-2000 family

**2 Mbps**
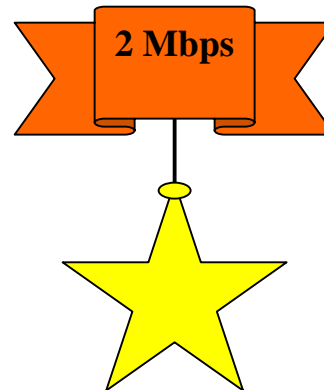
# DECT properties

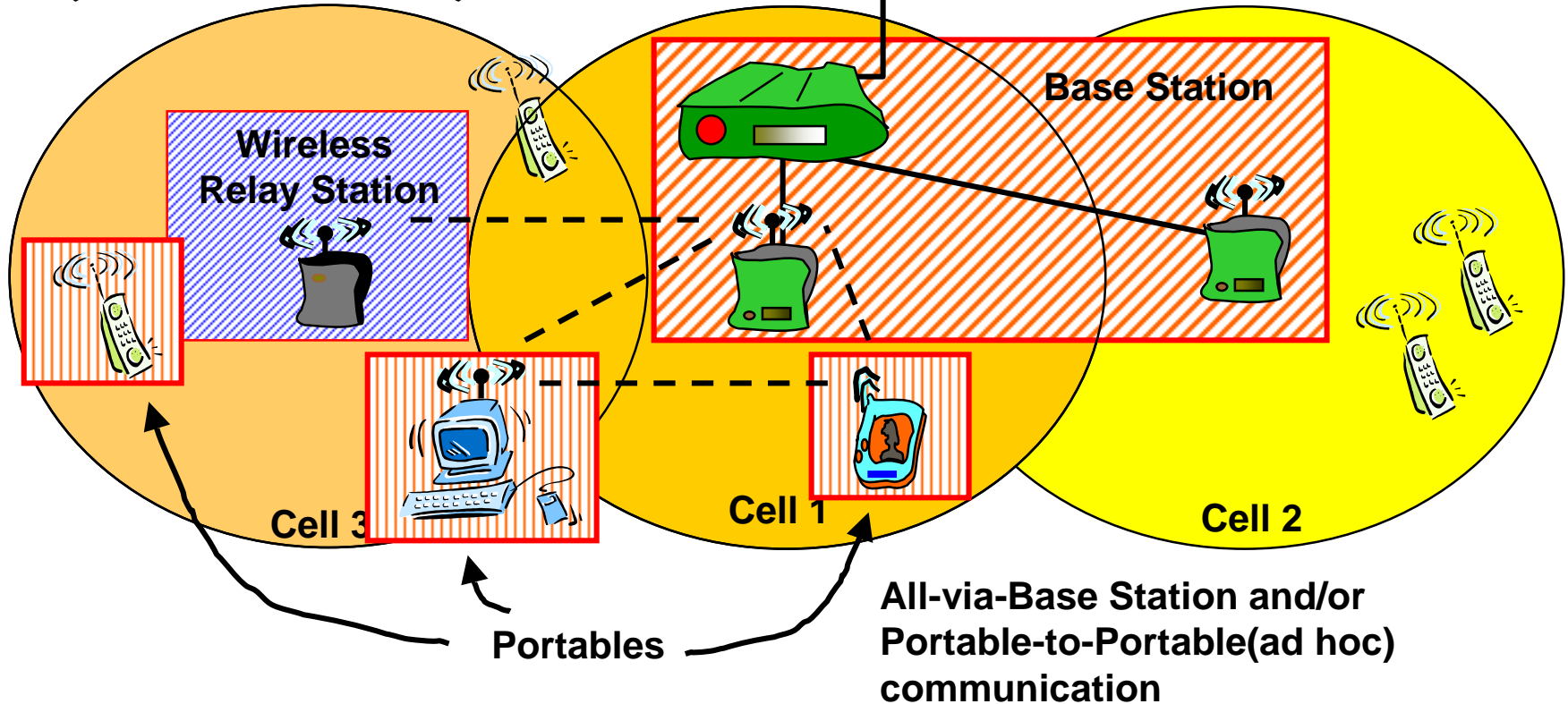# Technology properties

- A Multi-carrier, i.e. FDMA-TDMA system (10 ms frame/24 full-12 double slots/TDD)
- Maximum peak transmit power 250 mW per carrier
- Single/Multi-cell architecture - Seamless Handover
- Dynamic Channel Selection (DCS) for re-use of spectrum and interference avoidance
- Power management for interference limitation

# DECT Reference model (terminals)

UMTS core, cdma2000,
IP (xDSL, CATV, fiber)

Wireless
Relay Station

Base Station

Cell 3

Cell 1

Cell 2

Portables

All-via-Base Station and/or
Portable-to-Portable(ad hoc)
communication

# DCS - efficient re-use of spectrum (1)
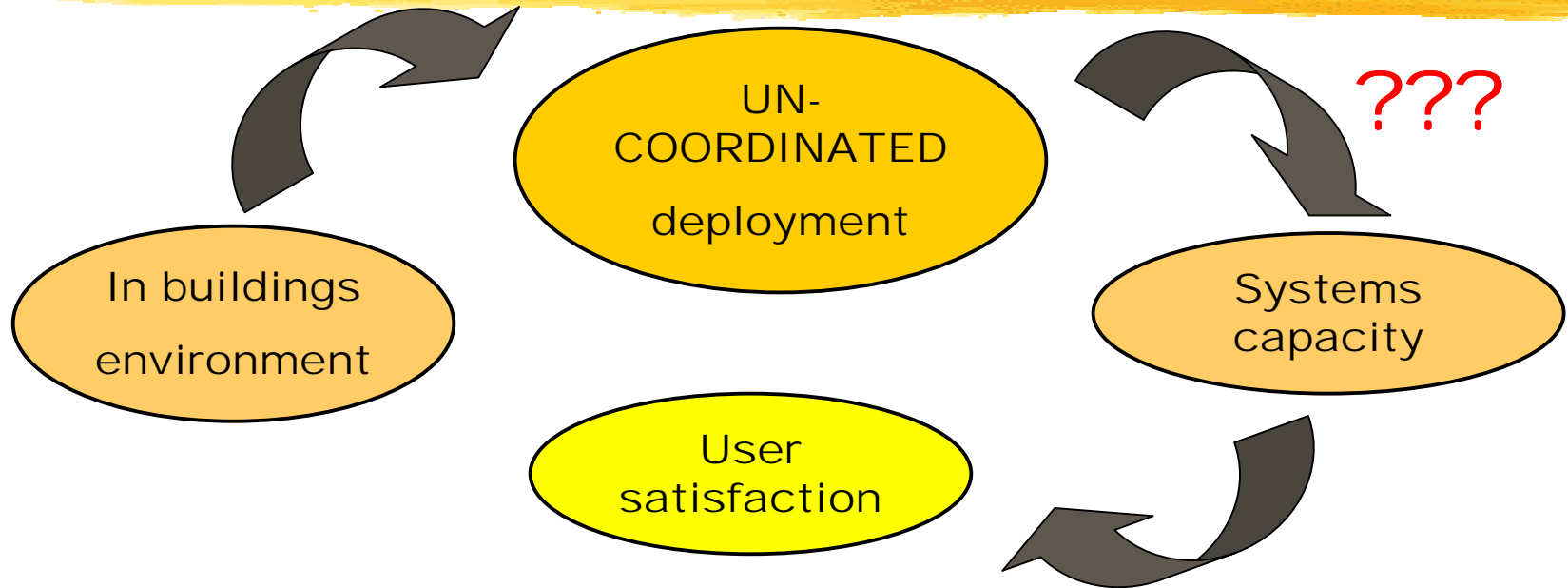


⌘ In a uncoordinated deployment scenario, the number of non interfering one another simultaneous (in-parallel) transactions that can take place at one location determines the system capacity

# DCS - efficient re-use of spectrum (2)



A frame - 24 full simplex slots

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

## 10 DECT carriers -> 120 simultaneous voice calls; >60 256 Kbps data calls

# DECT services - VOICE Telephony(1)

⌘ 10 years of development experience - millions of terminals shipped

- ⌃ Excellent voice quality
- ⌃ Low cost
- ⌃ Reliability
- ⌃ Customer awareness

# DECT services - VOICE Telephony(2)

- Standard real-time two-way speech 3,1 kHz telephony teleservice Speech coding algorithm conforming to ITU-T G.726 for 32 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)

- Core NWK access: PSTN, ISDN, IP, GSM, UMTS

- Seamless Handover

- Range: 50m through walls and floors, 300m in free space, 15km achieved for RLL

- Multi-handset (free calls), rich supplementary services - CLIP &Co., PP-to-PP communication (Walki-Talki), etc.

# DECT Services - DATA

- Various data rate speeds optimized for various applications
  - Low - Home automation: white appliances, control devices, meters, surveillance systems
  - Medium - Internet, multimedia messaging, printing
  - High - Entertainment: video, audio; File transfer
- Build upon the experience of the voice telephony - low cost, reliability
- Secure

# DECT Packet Radio Service (DPRS)(1)

- ⌘ Focus on cable replacement, data networking, combined with voice to provide true multimedia
- ⌘ Access: Ethernet, IP, PPP, V.24, indirect USB, UMTS core
- ⌘ Connection oriented (QoS) with connection establishment time <50ms and fast suspend and resume
- ⌘ Base assisted and Ad hoc communication
- ⌘ Range: 50m through walls and floors, 300m in free space

# DECT Packet Radio Service (DPRS)(2)

❆ Data Rates: For the user the date rate on the top of the technology matters (user data rate) - not the data rate on the air

❆ DECT IMT-2000: up to **2.5 Mbps user data rate** (single carrier $\pi$/8-D8PSK modulation) *<standardized>*

❆ All Users of one (single radio) Base station share this 2.5 Mbps

❆ At one location (e.g. apartments building - 5 closely located neighbors) as may carriers allocated to DECT as many simultaneously operating BS can provide each up to 2.5 Mbps

# DECT Packet Radio Service (DPRS)(3)

✤ Today: up to **843.2 Kbps user data rate** (double slot - single B-sub-field - single zero blind slot radio - GFSK modulation)

BOM:         average FP $40 - PP (USB) $27

Including:  Chip ($6),
            Zero blind slot radio ($6),
            USB and Ethernet controllers,
            Flash, plastics, … ALL !!!

✤ Display will add substantially - a full graphic, 200 x 160 pixel, 4 gray scale, 10 lines - around $20 plus

# DECT Packet Radio Service (DPRS)(4)

- **Beyond IMT-2000**: up to **15 Mbps** (single and wide carrier 64-QAM modulation) *<under standardization - 2001>*

- BOM (only connecting modules - no additional components as e.g. display) - not more than the BOM for today's 802.11b or HomeRF

- One BS can handle simultaneously for example 2 high quality (16:9) stereo video channels + 1 CD quality audio channel + 2 multimedia messaging channels (MPEG4 like) + 2 voice calls + 1 2Mbps Internet channel

# DECT - UMTS interworking
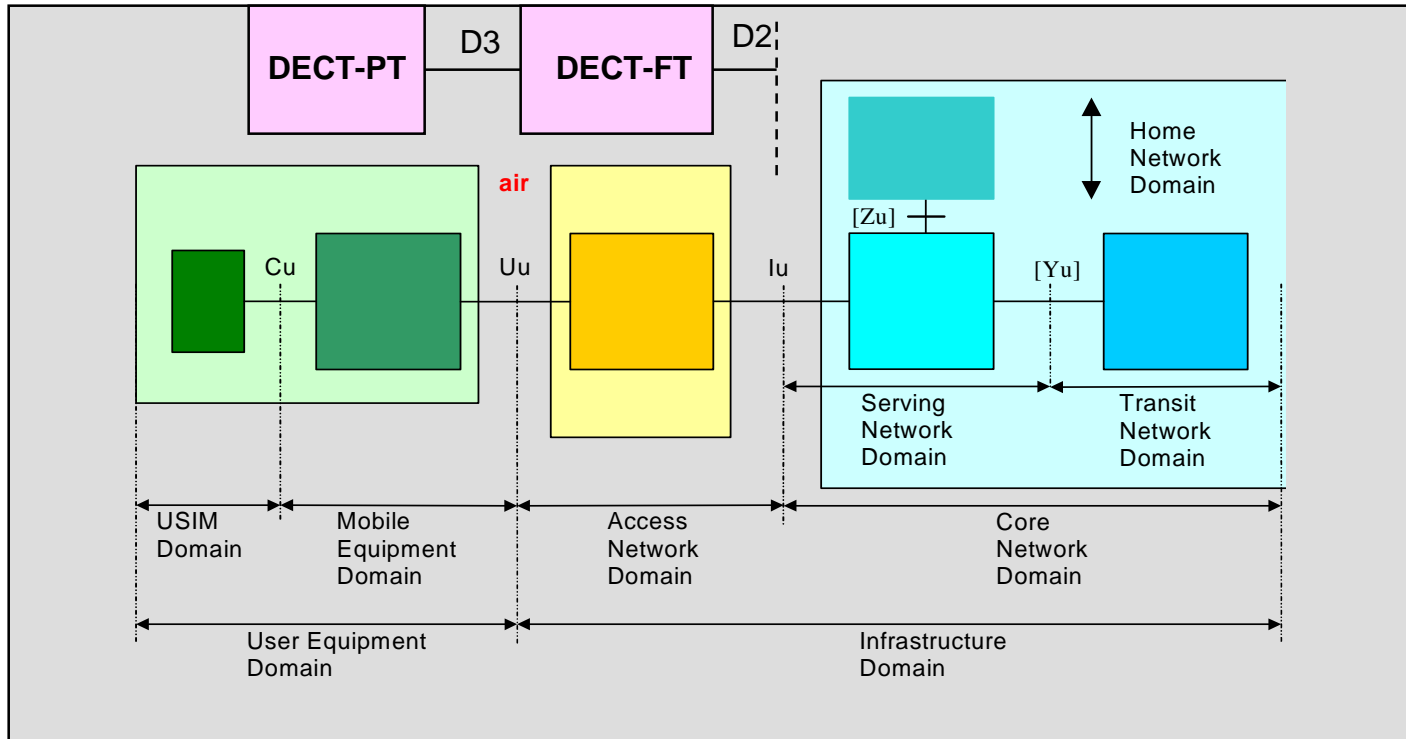
# DECT IMT-2000 Related Standards (1)

- **ITU-R M.1457** DETAILED SPECIFICATIONS OF THE RADIO INTERFACES OF INTERNATIONAL MOBILE TELECOMMUNICATIONS-2000 (IMT-2000)
- ETSI EN 300 175 DECT; Common Interface (CI) - **The 8 part DECT base standard**
- ETSI EN 300 176 DECT; Digital Enhanced Cordless Telecommunications (DECT); **Approval test specification**
- ETSI EN 301 908-10 Electromagnetic compatibility and Radio spectrum Matters (ERM);Base Stations (BS) and User Equipment (UE) for IMT-2000 Third-Generation cellular networks;Part 10: **Harmonized standard** for IMT-2000 FDMA/TDMA (DECT) covering essential requirements of article 3.2 of the R&TTE Directive
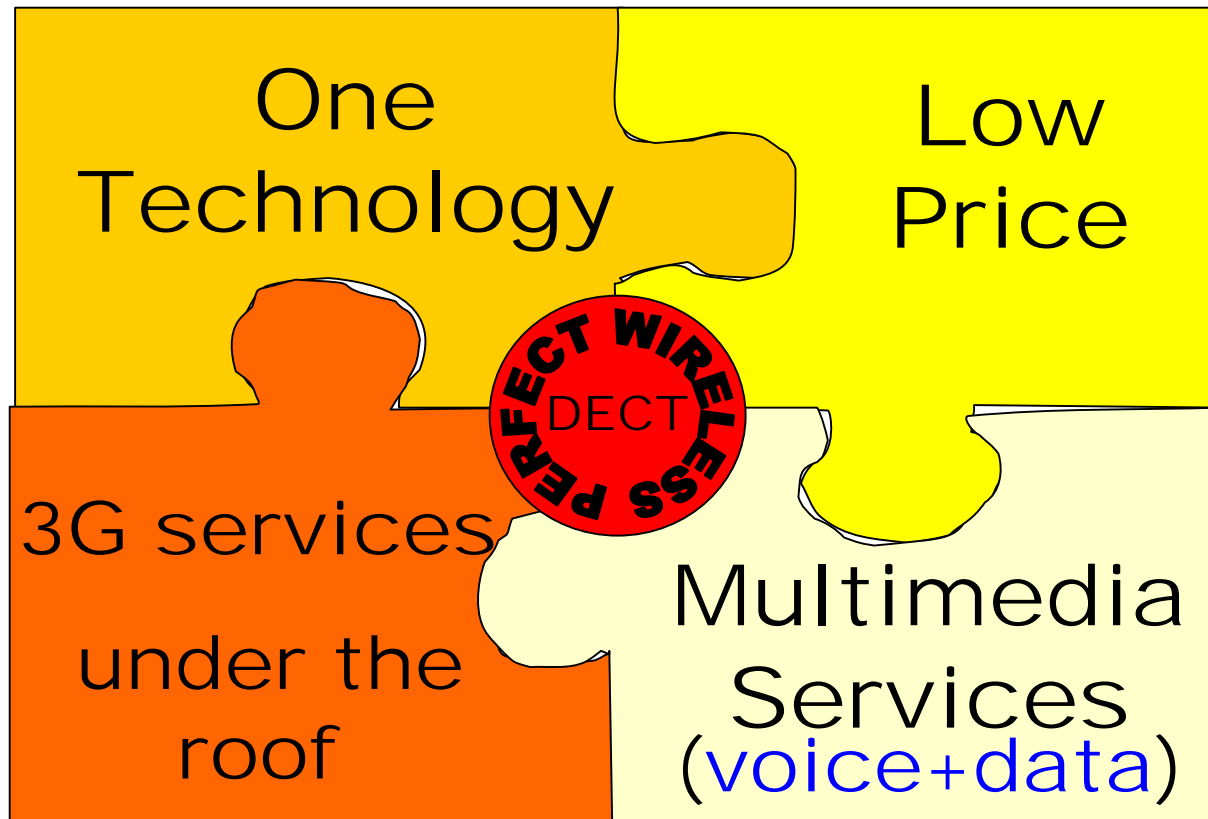- **ETSI TR 101 178 DECT; A high level guide to the DECT standardization**

# DECT IMT-2000 Related Standards (2)

- ⌘ EN 300 444 DECT; Generic Access Profile (GAP)  - **The basic voice profile**

- ⌘ EN 301 649 DECT; DECT Packet Radio Service (DPRS) - **The basic data profile**

- ⌘ TS 101 863 DECT; **DECT/UMTS Interworking Profile** (IWP);
  Part 1: General description and overview
  Part 2: CN-FP interworking
  Part 3: 3,1 KHz speech service
  Part 4: Supplementary services
  Part 5: SMS point to point and cell broadcast
  Part 6: Packet switched data

# DECT
# business case

# The DECT IMT-2000 Business Case



One
Technology

Low
Price

PERFECT WIRELESS
DECT

3G services

under the
roof

Multimedia
Services
(voice+data)

# 3G services in the home (DECT)

⌘ Why should we care?

- ☒ Fixed and low mobility users will not disappear any soon

- ☒ Service Revenue comes with customers

- ☒ Unique Services have the same price everywhere

- ☒ Early service deployment - home NWKs are already here

⌘ Unlicensed Vs. Licensed band

- ☒ Can licensed band serve the home user?

# 3G services in the office (DECT)

⌘ Why should we care?

  ⊠ Business workers will most likely be the early adopters of 3G

  ⊠ Convergence between 3G and Office Service will be very attractive

  ⊠ Outsourcing the IT services - sources for new revenue

⌘ Multi-mode Terminals

  ⊠ 3G services at any place - Revenue … Revenue … Revenue --- Happy Customer

# DECT for public use

- ⌘ Local spots
  - ⊠ ADDS-ON to an existing 3G network (e.g. UMTS, cdma2000) - taking out the burden - redirecting traffic
  - ⊠ Early testing of user attitude to new 3G services
- ⌘ Utilizing
  - ⊠ DECT effectiveness in high-density areas
  - ⊠ 10 years experience: Low cost terminals, quick time to market for services that need <840 Kbps

# DECT IMT-2000

# perfect wireless