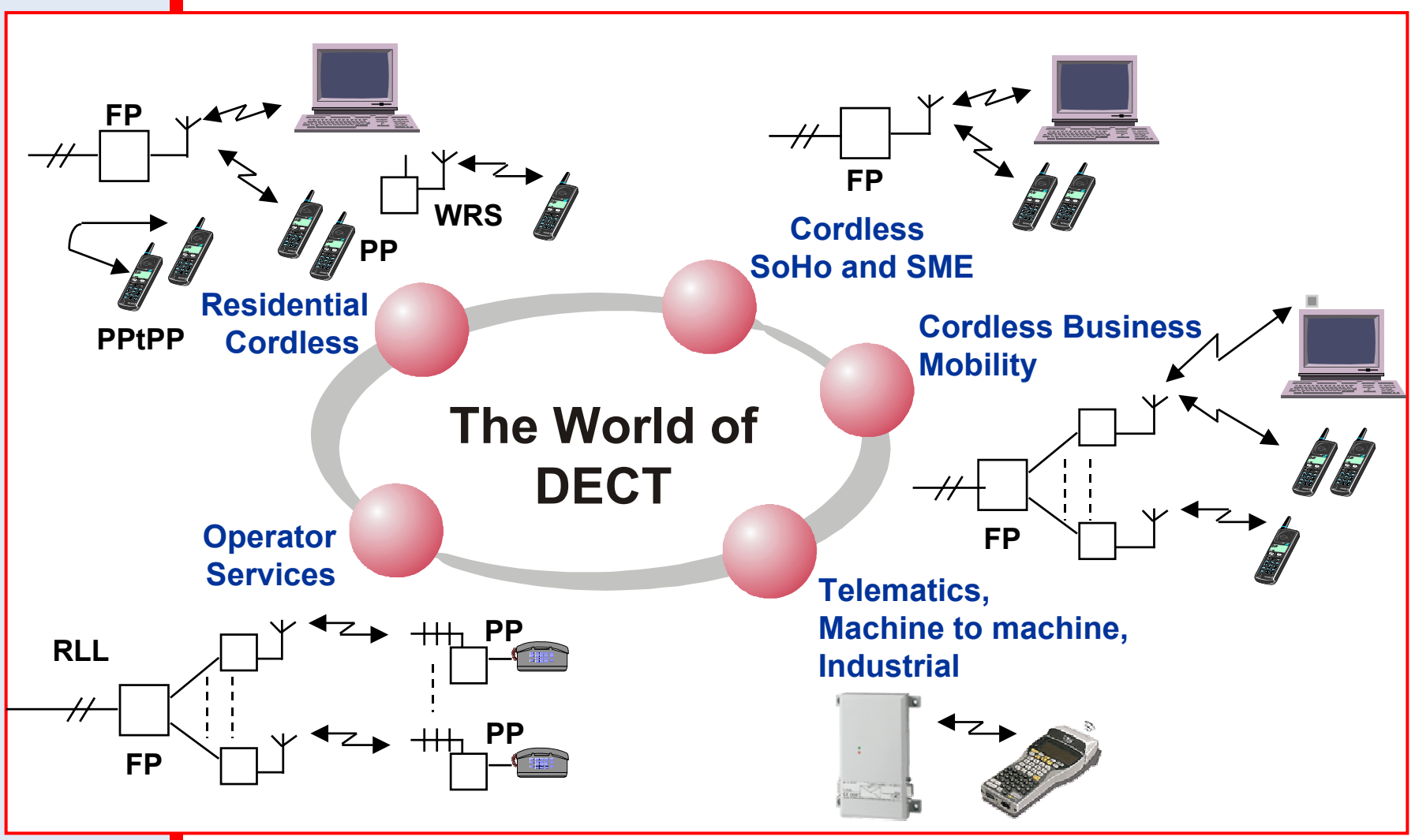

DECT
FORUM
DECT Congress 2003
Erich Kamperschroer
Chairman DECT Forum

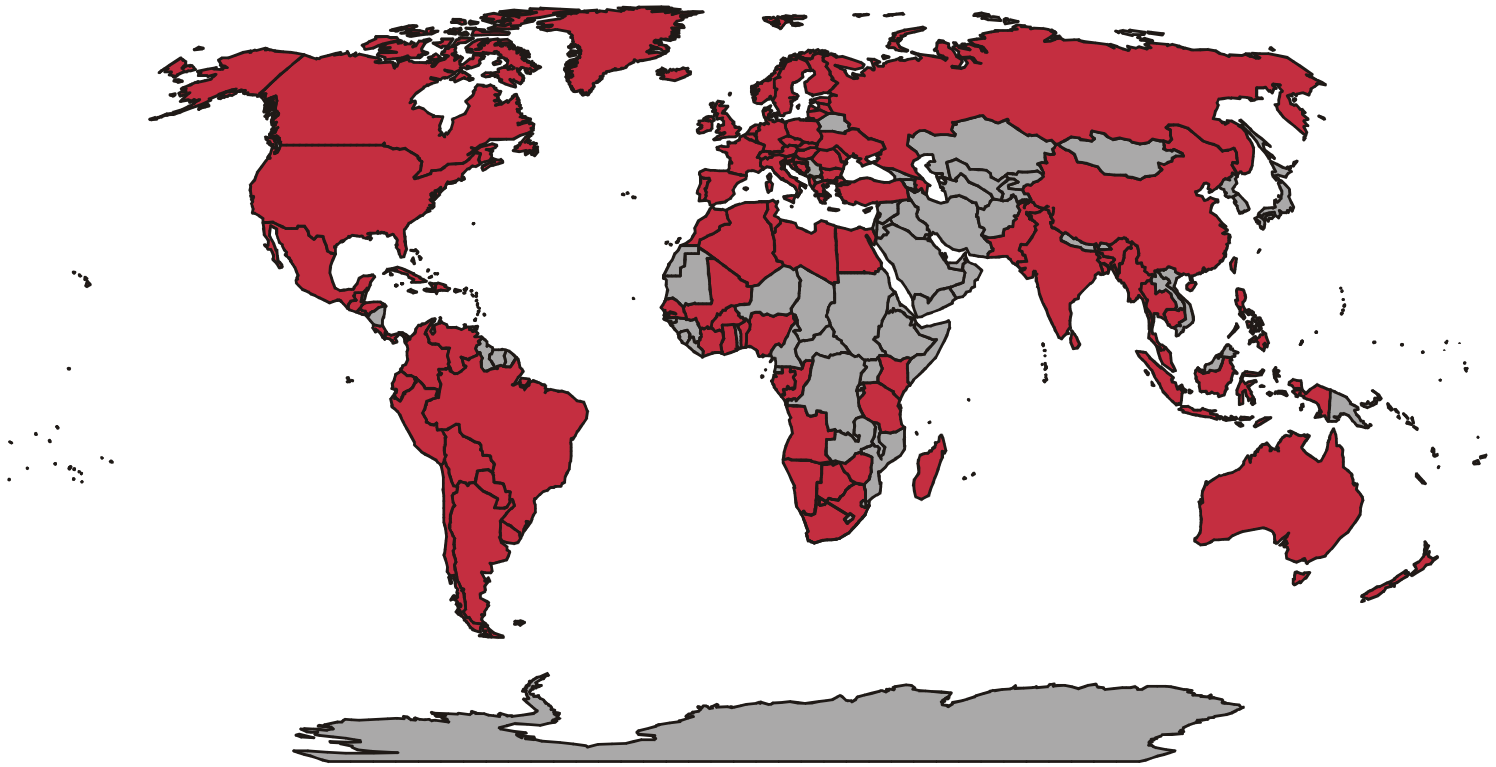
Worldwide DECT Deployment

DECT applications and feature



DECT is a worldwide deployed technology

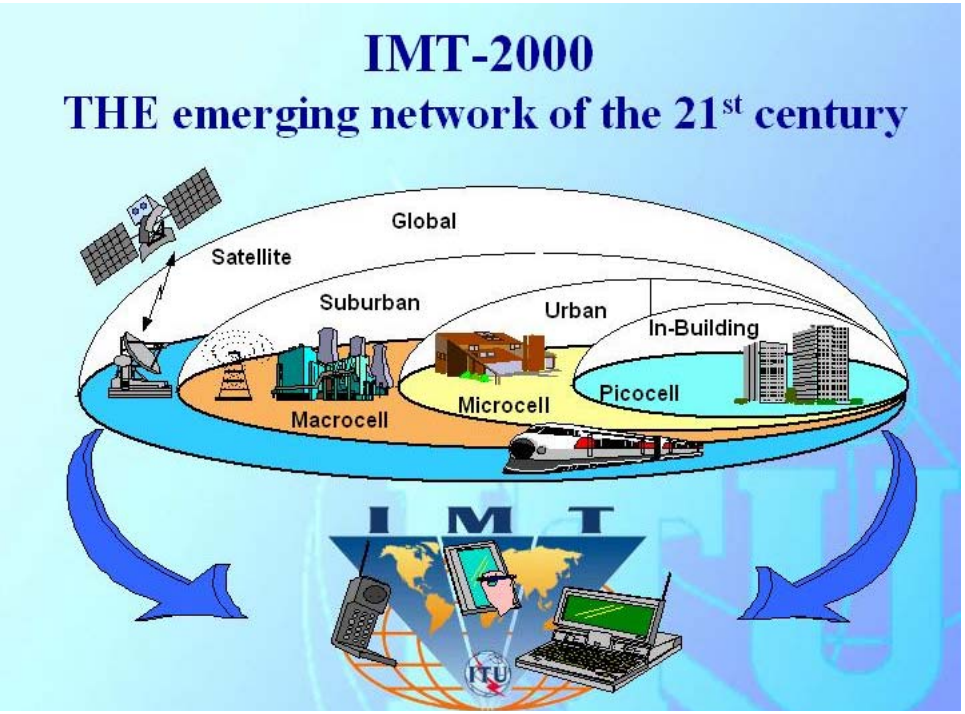
… Adopted in more than 110 countries



Source: DECT Forum

DECT is recommended by ITU for 3G deployment (IMT-2000)

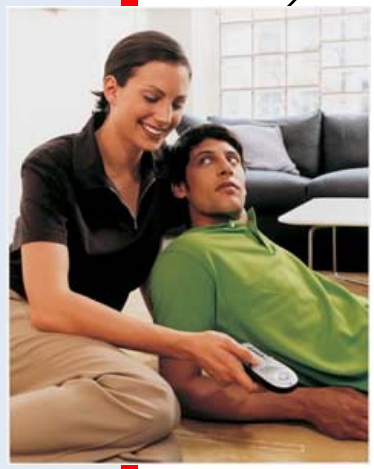
DECT is the only IMT-2000 family member optimized for unco-ordinated use on an unlicensed spectrum

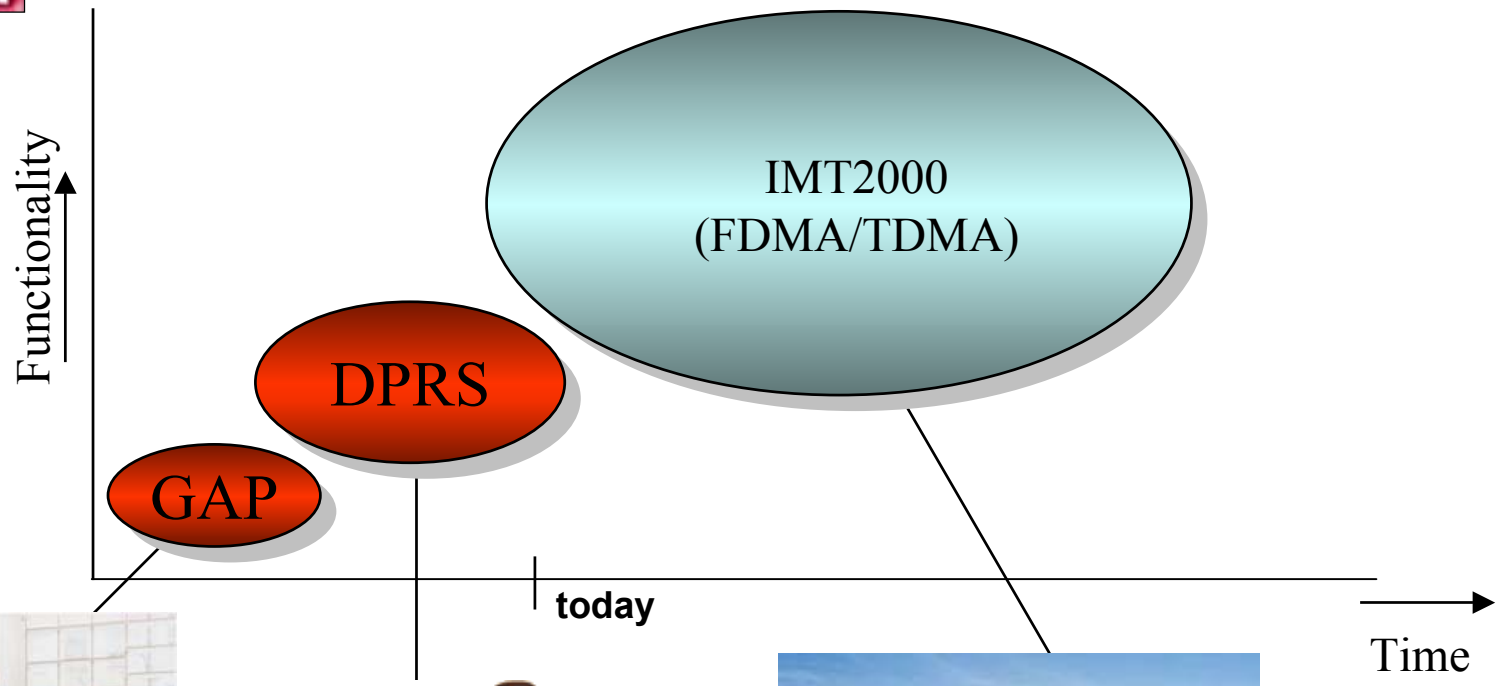


IMT 2000 Terrestrial Radio Interfaces

IMT-2000 CDMA Direct Spread	IMT-2000 CDMA Multi-Carrier	IMT-2000 CDMA TDD	IMT-2000 TDMA Single Carrier	IMT-2000 FDMA/ TDMA
WCDMA (UMTS)	CDMA2000 1X and 3X	UTRA TDD and TD-SCDMA	UWC-136/ EDGE	DECT

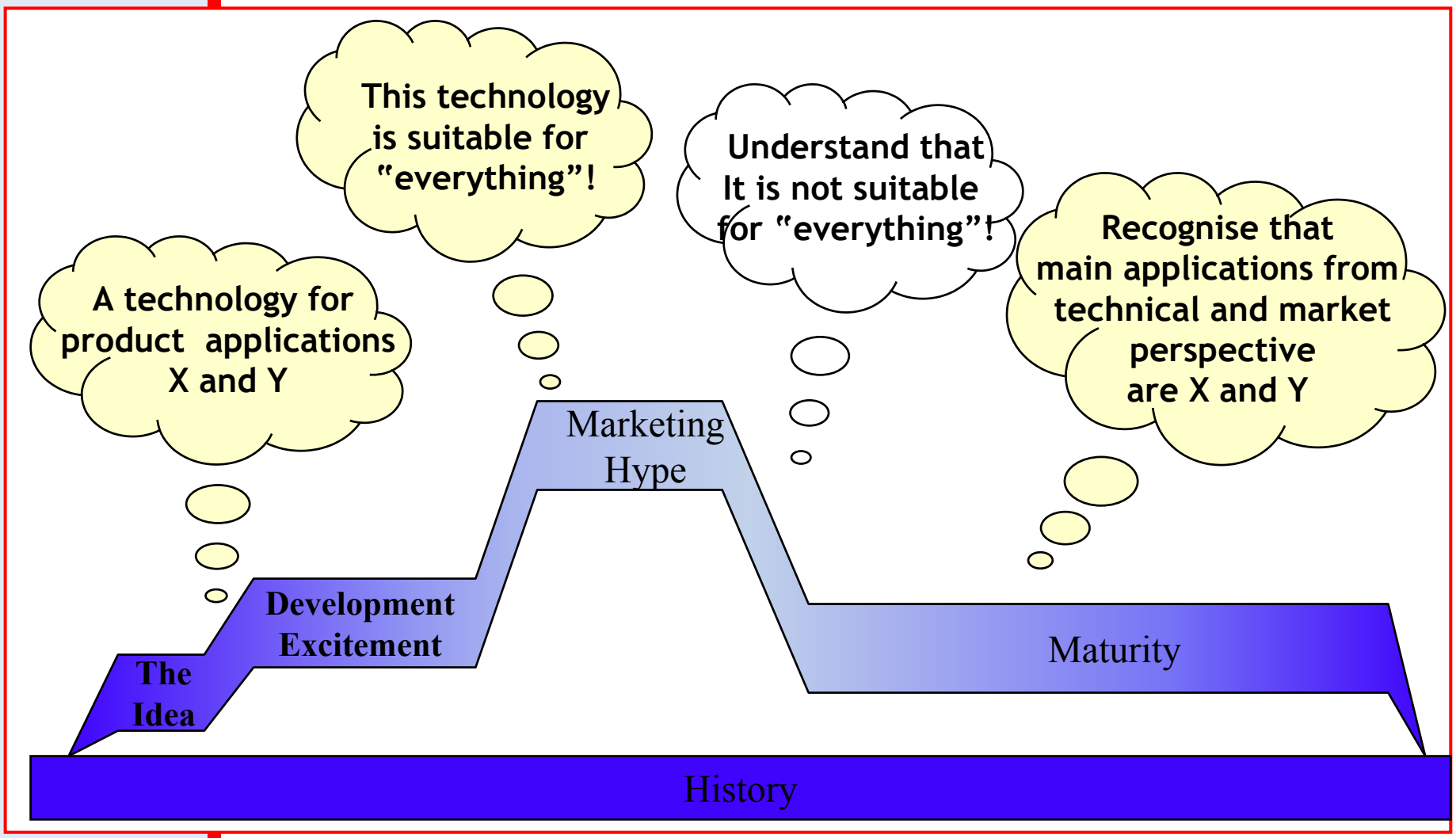
DECT migration path towards IMT 2000





The position of DECT in the short range wireless solutions market

Pealing of the "marketing hype" from the technologies and apply a "matured" view



Pealing off the Marketing Hype GSM

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Macro-cellular wide area coverage with core network services.	Residential base stations. Office Pico-cellular infrastructures Locally tailored enterprise services.	Macro-cellular wide area coverage with core network services, sometimes comple-mented by Centrex /VPN functions. Public indoor hotspots with multi-operator distributed antenna systems.

Pealing off the Marketing Hype DECT

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Residential cordless systems.	Same handset for home, office and large city centre public.	Residential cordless systems.
Office Pico-cell mobility.	Every enterprise employee will have a cordless phone.	Office Pico-cell mobility.
Public pedestrian systems.	WLAN technology.	
Voice and medium rate data.		Voice and medium rate data.

Pealing off the Marketing Hype Bluetooth

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Short cable replacement, mainly for best effort data. On-body voice link from mobile phone to mini-headset.	Residential cordless system. Office voice mobility system. WLAN technology.	Short cable replacement, mainly for best effort data. On-body voice link from mobile phone to mini-headset.

Pealing off the Marketing Hype IEEE 802.11b WLAN

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Wireless access points for Ethernet LANs.	Voice services.	Wireless access to LAN best effort data services.
Wireless access to DSL/Cable.	Voice handover.	Wireless access to DSL/Cable.
	Replace wired LAN.	

Positioning of wireless technologies for voice and data

	Personal Area & Short Cord replacement	Local Area		Wide area (Indoor&outdoor coverage from outdoor cells)
		Single cell	Multi-pico-cell with handover	
Voice & voice band data <9.6, 32 or 64 Kbps	Bluetooth DECT	**DECT**	**DECT**	**Cellular 2G+/3G technologies**
Best effort Data <0.5 - 1 Mbps	**Bluetooth** DECT	**802.11b** **DECT**	DECT	Cellular 2G+/3G technologies
Best Effort data >1 MBps	**802.11b**	**802.11b**	–	–
Real Time Streaming Data <05. - 1 Mbps	DECT Bluetooth	802.11b	DECT	Cellular 3G technologies
Real Time Streaming Data > 1MBps	(5 GHz WLAN)	(5GHz WLAN)	–	–

Legend: non underlined: suitable technology // underlined: used in the market

Emerging markets

Secure existing markets and open new ones

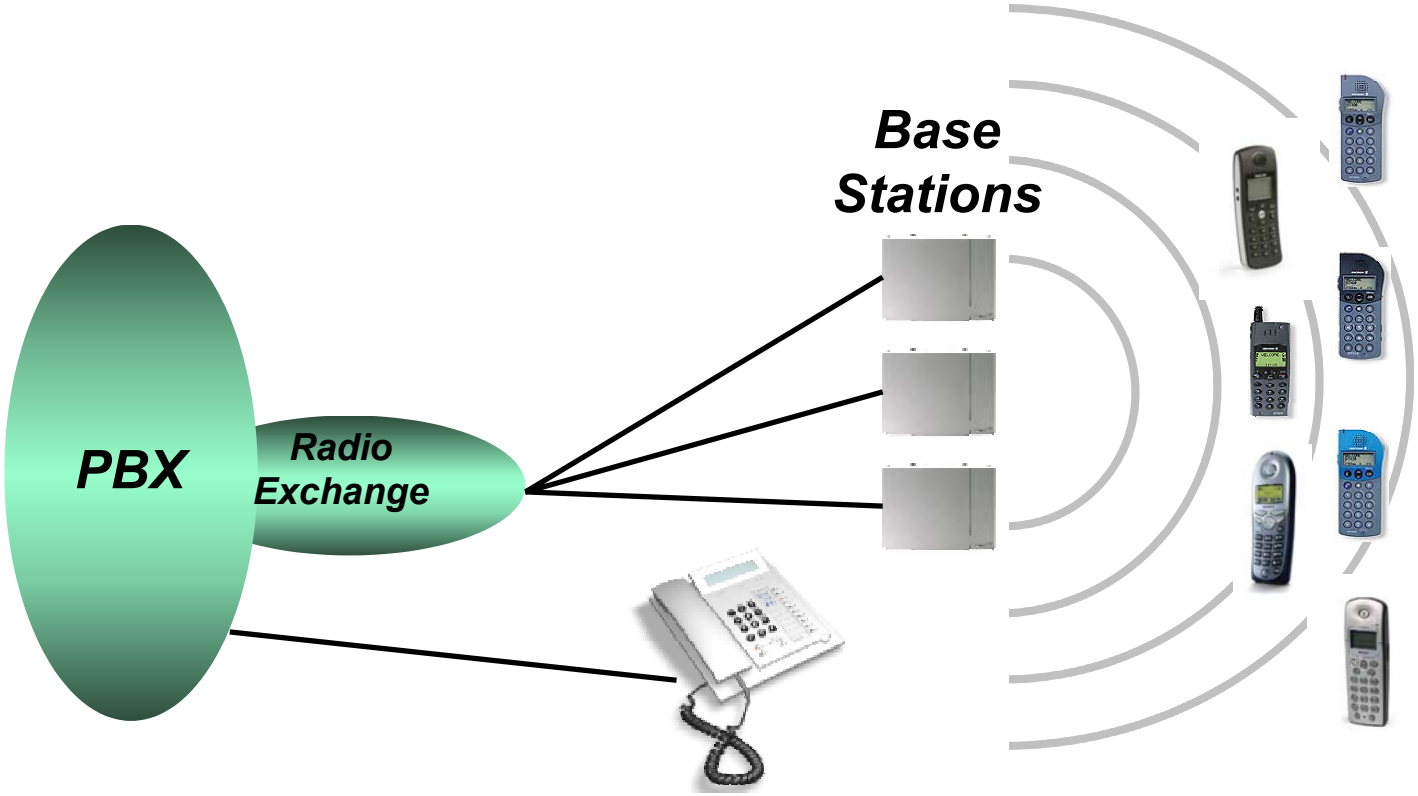
- Secure existing DECT deployment
  - DECT is IMT 2000 standard
  - Secure world-wide frequencies
- USA market
  - FCC rule change
    (Basic DECT for 900 MHz, 2.4GHz and 5,8 GHz ISM bands)
  - New spectrum for Advanced wireless services (AWS)
  - UPCS band cleaned from microwave links latest 2006

Emerging applications offer new opportunities for DECT

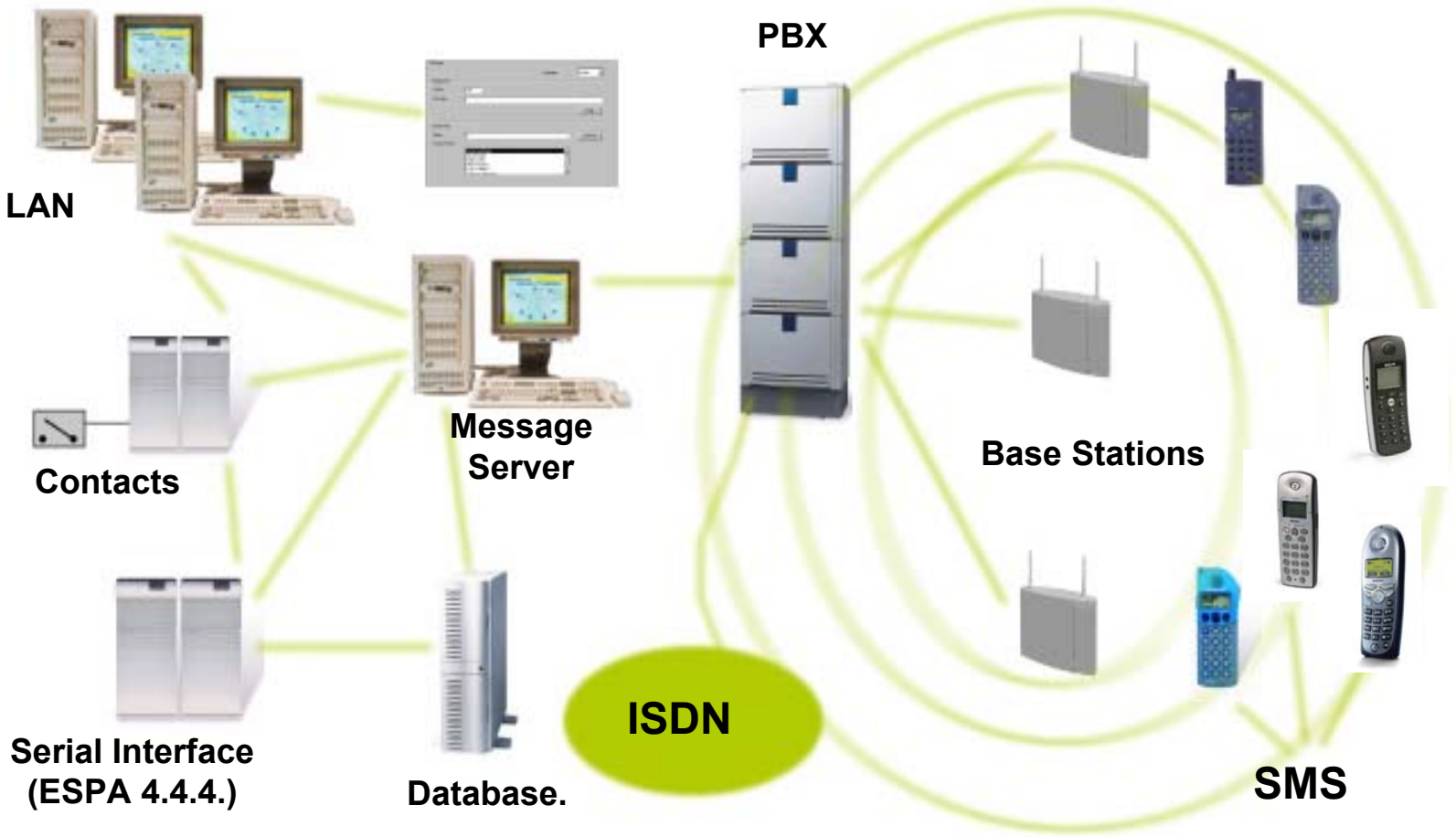
Emerging applications:

Enterprise market

Today's PBX's have integrated cordless with value adds



Phone system becomes now completely integrated into enterprise information system

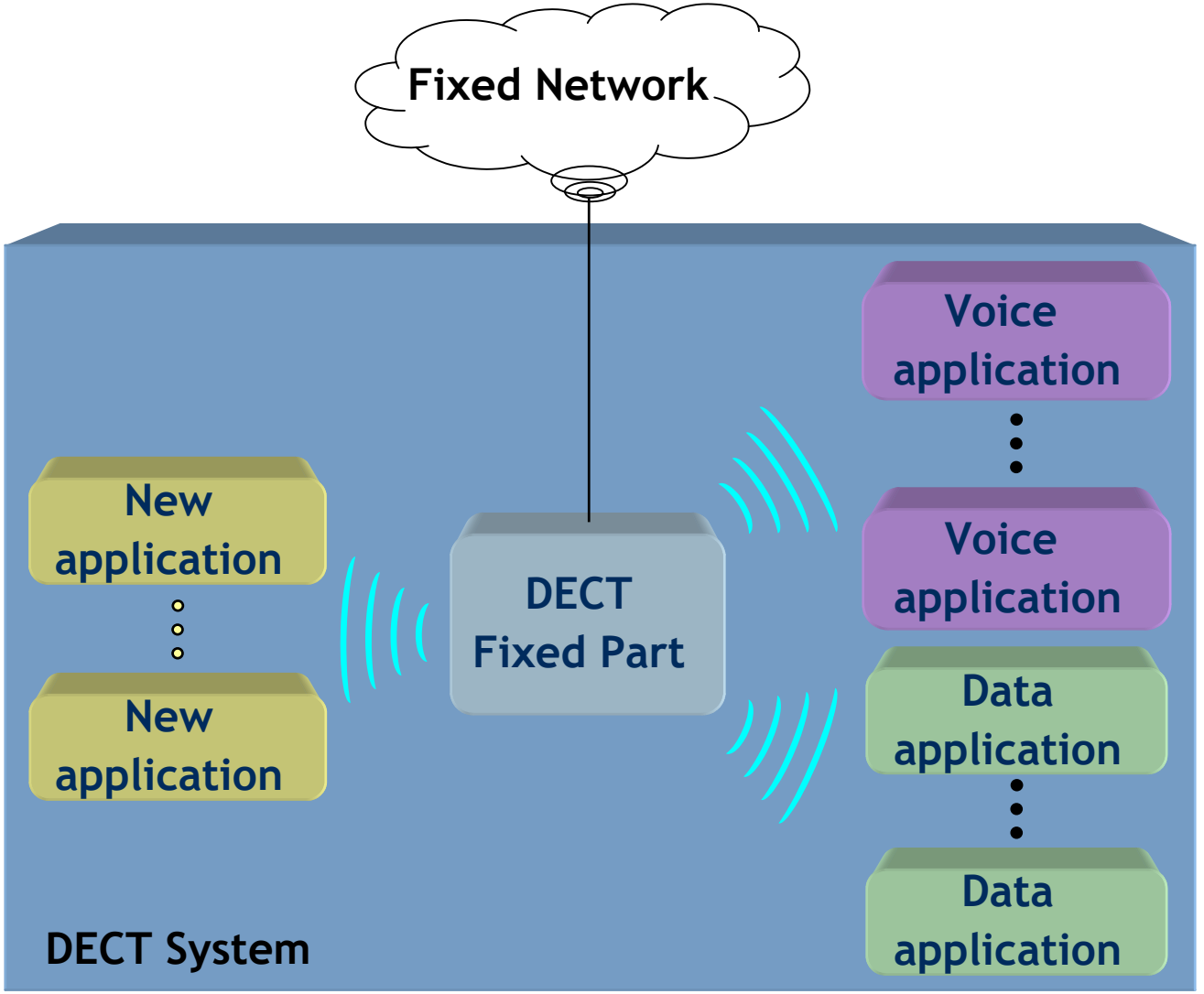


Emerging applications:

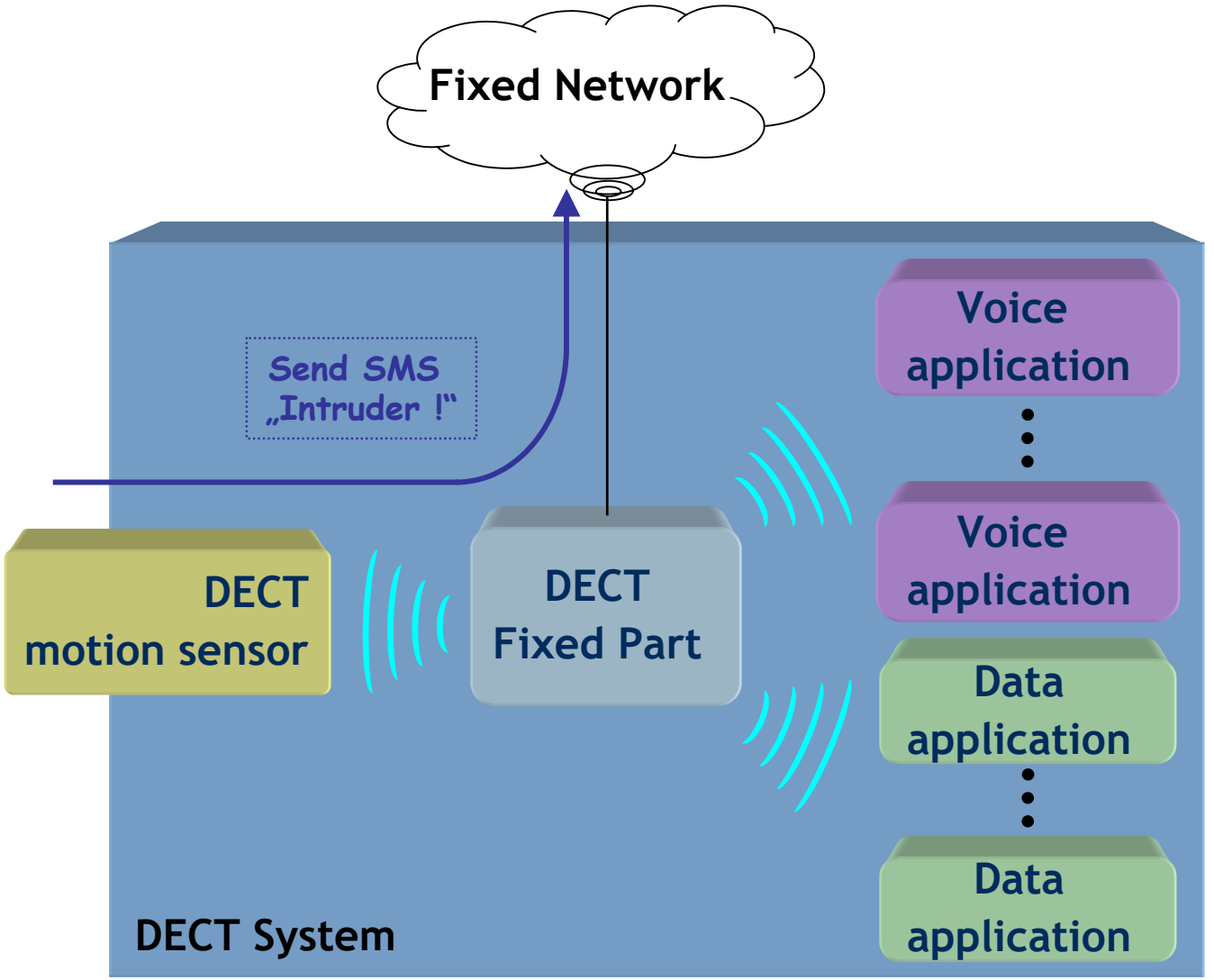
Residential market

Use the huge installed base for introducing new applications

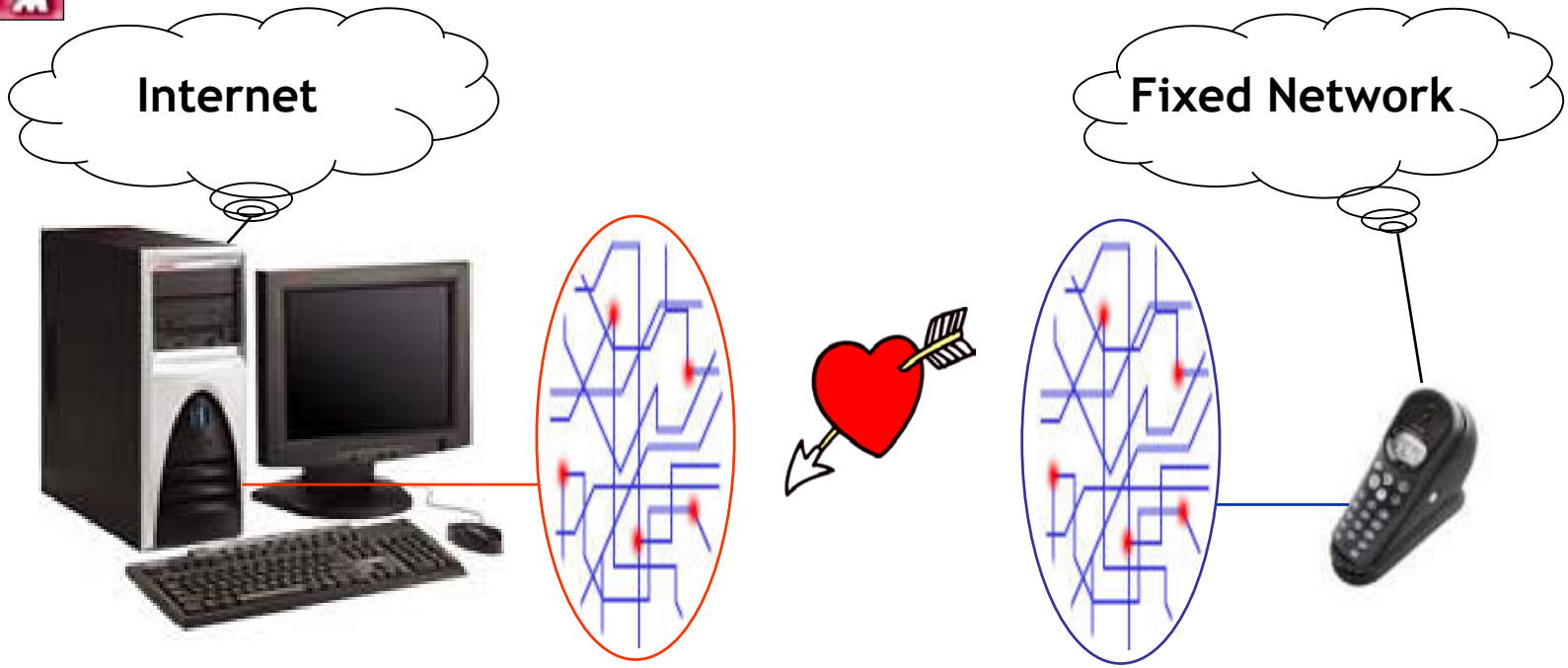
- F-MMS
- VoIP
- PC-Phone connectivity
- Home Control
- Telematics
- …



New app example 1:
Purchasing motion sensor accessory for existing DECT System

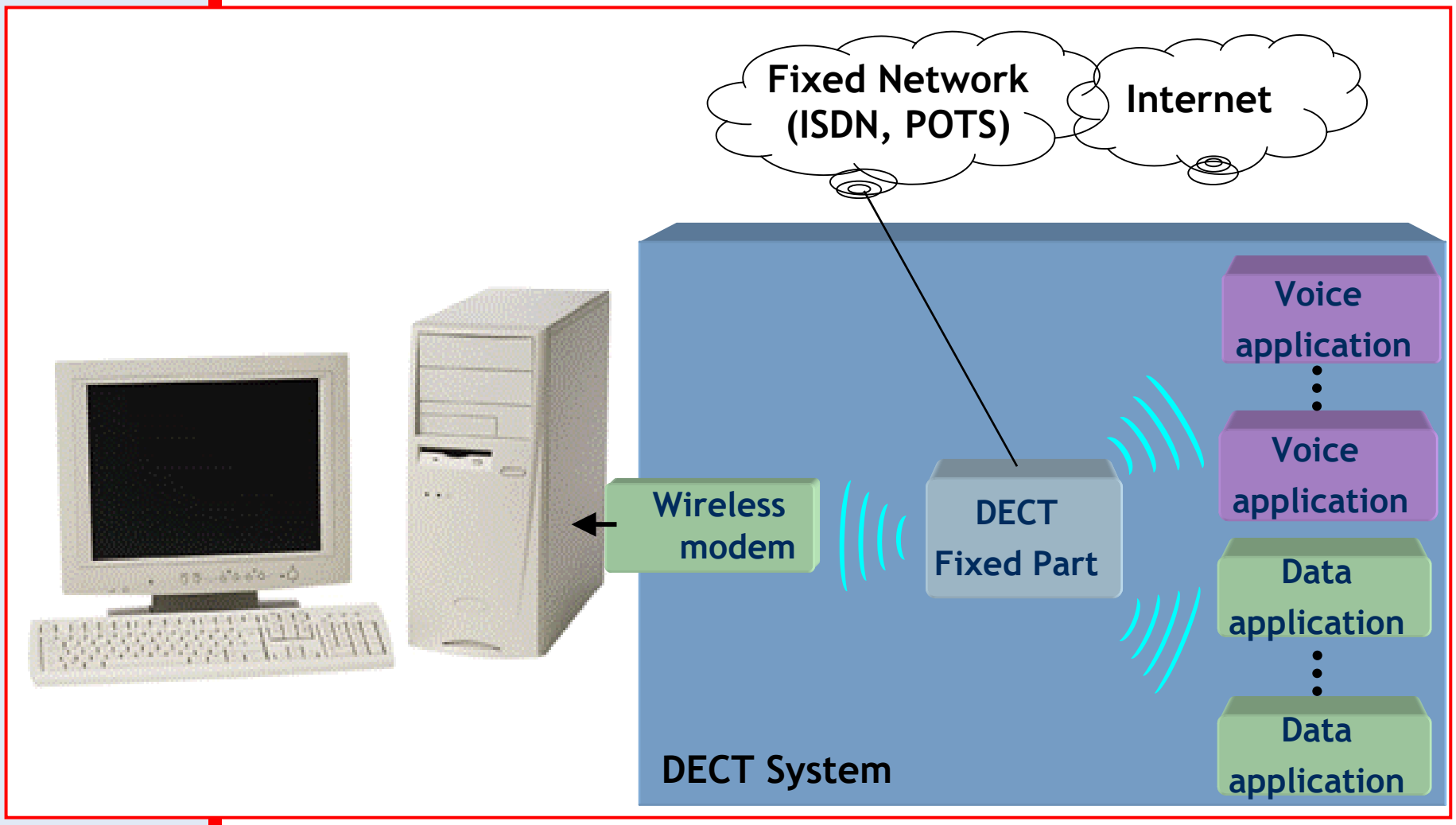


New app example 2:
Connect the communication network and the computer network

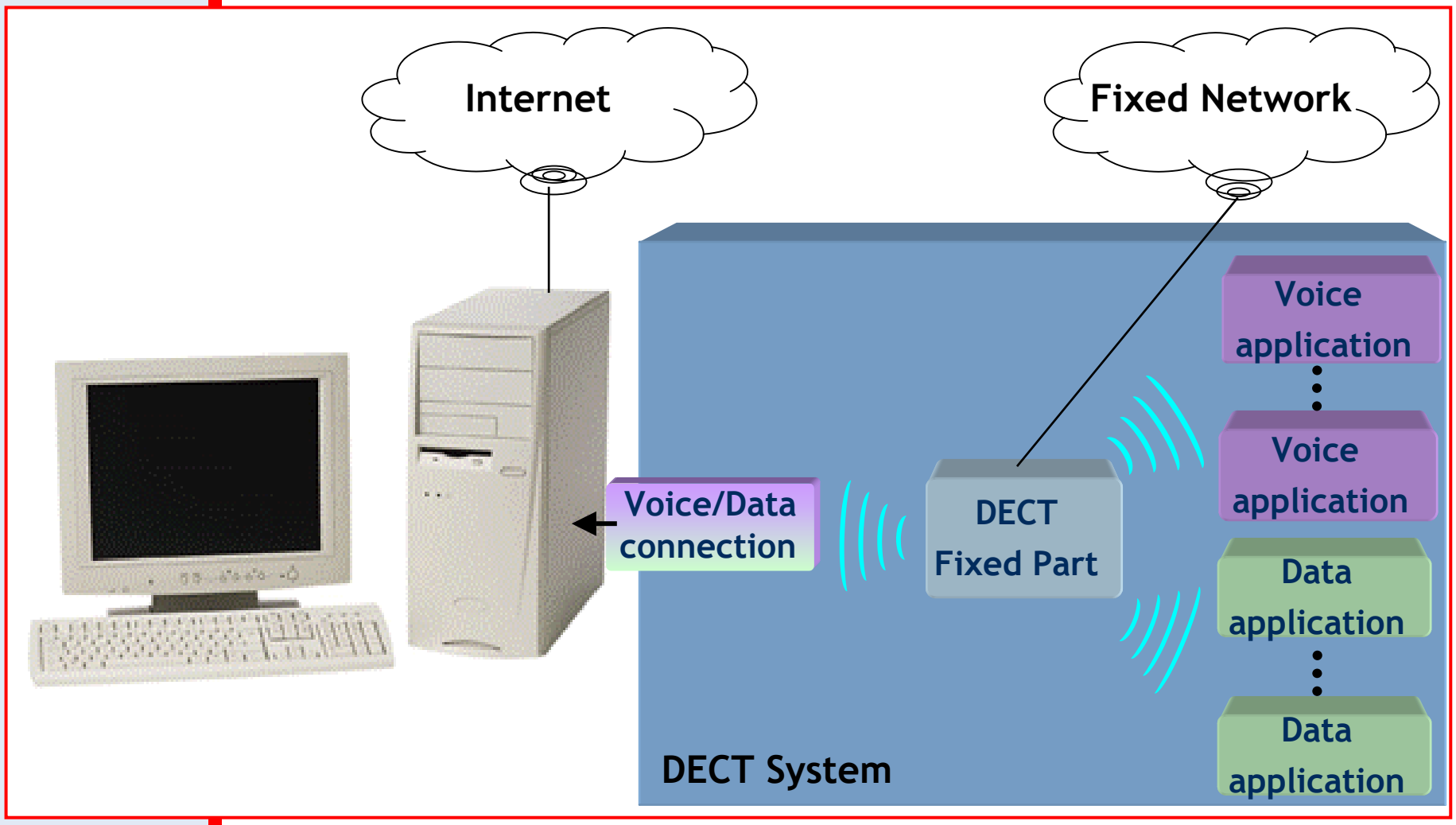


In the home the cordless phone network does not have a widely distributed connection to the computer network.

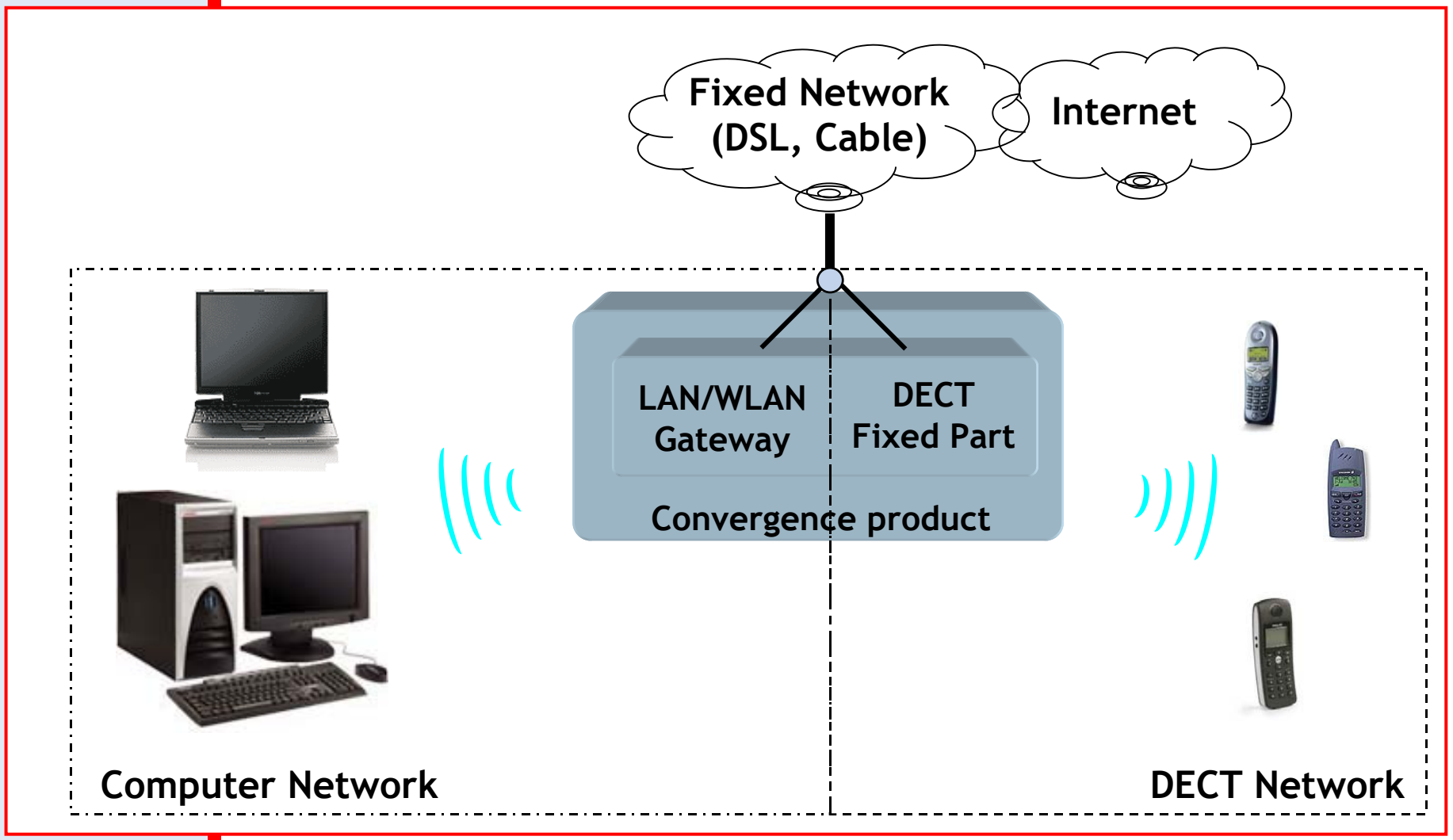
Today the main PC-Phone application is wireless modem



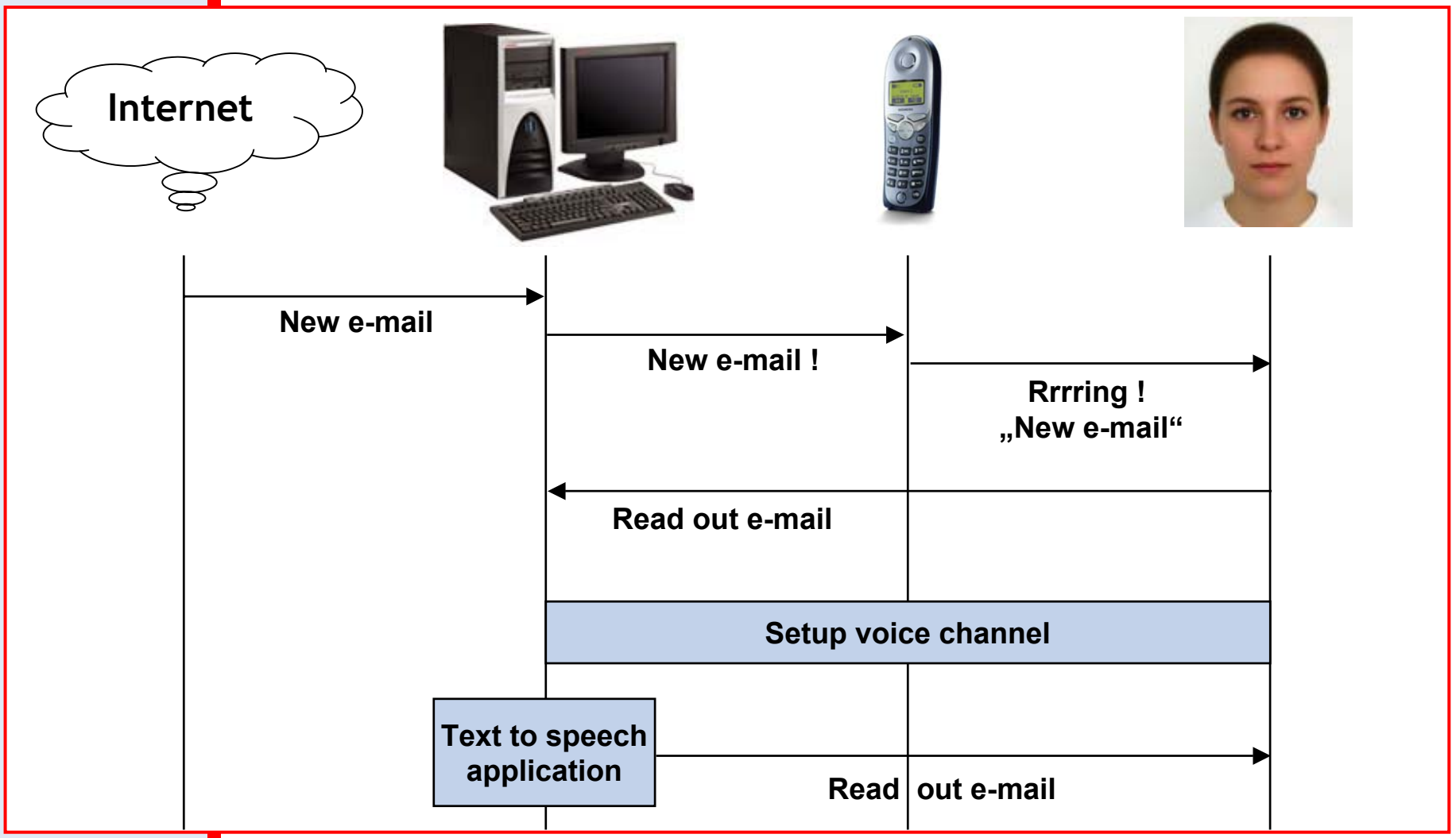
In future connectivity products combine voice and data services



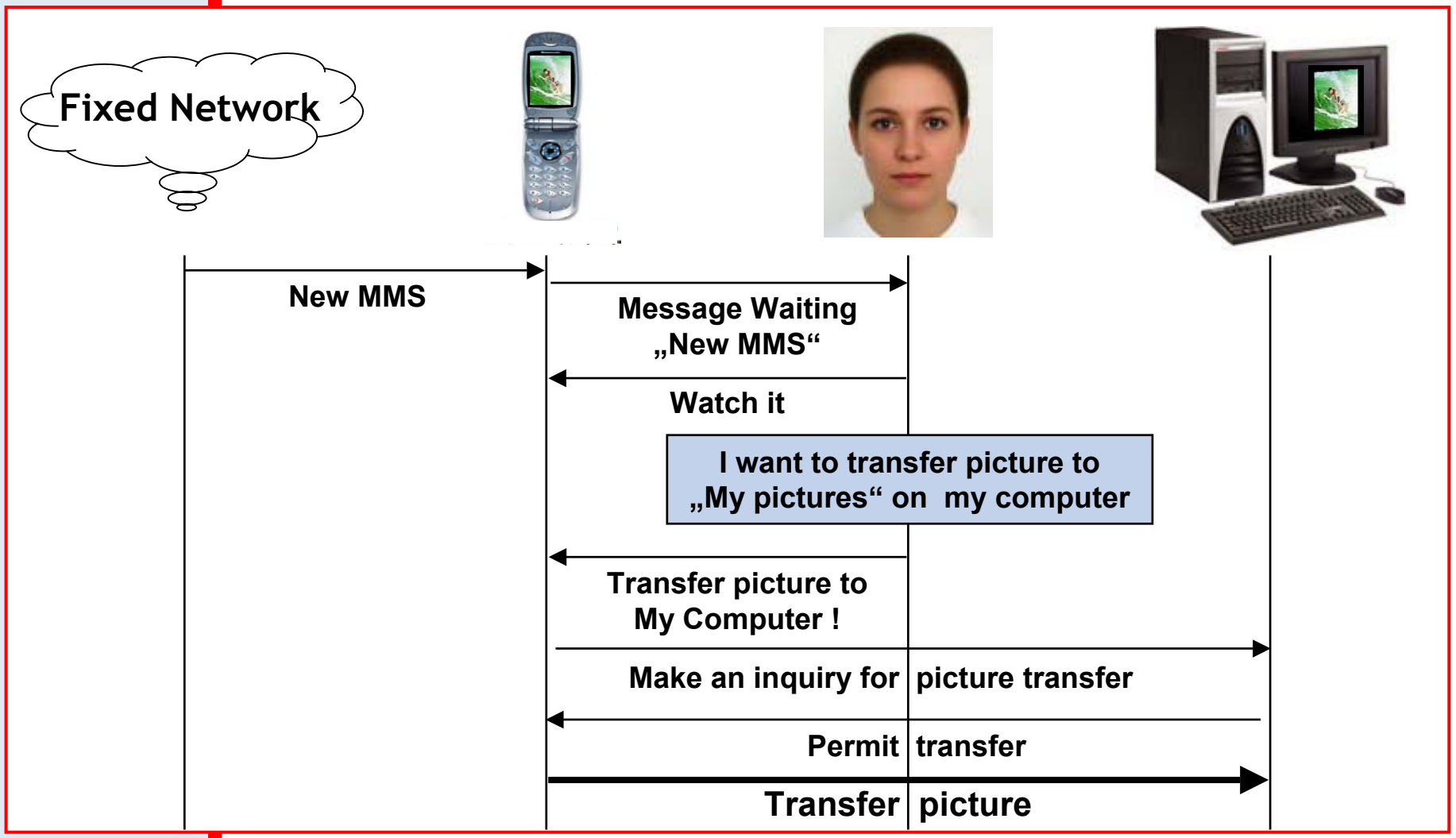
Or integrated Voice-Data products will marry voice and data world



Scenario example 1:
Computer reads out e-mail



Scenario example 2: Transfer MMS to Computer Library



Join the DECT community !

Value add for members

- DECT Forum fights for your markets
- DECT Forum fights for frequencies
- We promote your new applications
- Members get Business related, First-hand information

More info at
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Appendix:

More detailed information to technology positioning of DECT

Pealing off the Marketing Hype Wireless Access in Enterprises

Original idea/ specification	**Marketing Hype Extensions**	**Mature view of main application**
Wireless access is a complement to the wired infra-structures for voice and data in enterprises.	Wireless access will replace the fixed infrastructure for voice and data in enterprises.	Wireless access is a complement to the wired infra-structures for voice and data in enterprises. Fixed access is cheaper and better for most employees

Pealing off the Marketing Hype GSM

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Macro-cellular wide area coverage with core network services.	Residential base stations. Office pico-cellular infra-structures and locally tailored enterprise services.	Cellular coverage of residents and enterprises will mainly be made from outdoor macro-cellular networks, where the core network services sometimes are complemented by Centrex/VPN functions. Exceptions are public hot spots as airports and large shopping centres, which sometimes are provided with indoor distributed antenna systems, DAS, for multi-operator and multi-technology public access.

Pealing off the Marketing Hype DECT

Original idea/ specification	Marketing Hype Extensions	Mature view of main application
Office pico-cell mobility voice and medium rate data high quality services. Residential cordless systems. Public pedestrian systems.	The same DECT handset will be used in the home, office and in large city centre public pedestrian mobility systems. Every enterprise employee will have a cordless phone.	High quality voice and medium rate data pico cell mobility services. Mass market cordless residential systems. Enterprise pico-cell mobility systems, where totally about 10-15% of European PABX extensions will have cordless DECT access. Market size 2001: single cell 30 M (of which 4 M in small offices), multi-cell enterprise applications 1 M.

Pealing off the Marketing Hype Bluetooth

Original idea/ specification	**Marketing Hype Extensions**	**Mature view of main application**
Short cable replacement, mainly for best effort data.	Residential cordless system.	Short cable replacement, mainly for best effort data.
On-body voice link from mobile phone to mini-headset.	Office voice mobility system.	On-body voice link from mobile phone to mini-headset.
	WLAN technology.	

Pealing off the Marketing Hype IEEE 802.11b WLAN

Original idea/ specification	**Marketing Hype Extensions**	**Mature view of main application**
Wireless access points for Ethernet LANs. Point-to-multi-point cord replacements for best effort data services	Voice services. Voice handover. "All" PCs will have WLAN access.	Wireless access to LAN best effort data services. The wired LAN will always exist with better performance and at lower cost. Thus only a fraction (<10%) of enterprise PCs will use WLAN.

Service Requirements for Residential Technologies (1)

- **Low cost - Unlicensed spectrum:**
  Unlicensed technologies totally dominate due to required low cost distribution through retailers. Licensed spectrum, frequency planning and installation by qualified personal cannot be afforded.
- **Range:**
  A single base station must cover the home (basement, second floor, garden).
- **Telephony service - Speech quality:**
  The speech telephony service is still the most important service for residential offerings.
  Requirement for telephony quality excludes low bit rate codecs and *requires some protection of the spectrum.*

Service Requirements for Residential Technologies (2)

- **Best effort data services:**
  The main requirement is PC internet access. A protected spectrum is not required. The bandwidth requirements depend on which kind of data access is available to the residence.
  Required user bit rates depend on application:

-Voice band data modem access:	32-64 kbps
-ISDN access:	128 kbps
-ADSL access:	2 Mbps down-link (often limited to 500 kbps)
-CATV internet access:	5-10 Mbps
-Satellite internet access:	5 Mbps

Service Requirements for Residential Technologies (3)

- **Real time streaming:**
  Some protection of the spectrum is required.
  Required (down-link) user bit rates depend on application:

Radio listening (news):	32-64 kbps
High quality music listening (MP3, MPEG4-AAC):	128-256 kbps

  One TV channel may require 2-5 Mbps, depending on coding:

-MPEG2 4:3	2-3 Mbps
-MPEG2 16:9 HQ	4-5 Mbps
-MPEG4	about1 Mbps

  Required (down-link) user bit rate for TV streaming will be about 10 Mbps.

Main Unlicensed Residential Technologies

Technology	Main application
CT0 (old analogue)	Single cell low cost analogue residential phones (40 MHz band), mainly in the US, Latin America and Asia
DECT	Residential and enterprise high quality voice and medium data rate pico-cell mobility services on a protected spectrum available in most countries of the world (for the US see below)
DECT ISM **(new)**	Standard DECT on the US ISM bands (unprotected, but no interference from microwave ovens, Bluetooth or WLAN)
US-CT900	Residential and enterprise voice and medium data rate pico-cell mobility services on the US ISM bands
802.11b WLAN (main WLAN)	Wireless pico-cell access to Ethernet LAN best effort data services. World-wide 2.4 GHz ISM band unprotected spectrum
5 GHz WLAN (emerging)	Wireless pico-cell access for best effort data services. World-wide 5 GHz band unprotected spectrum. Large spectrum open some possibilities for real time and streaming services

Note: Bluetooth is a short range cable replacement and personal area networking technology mainly for best effort data, and is not a very suitable for cordless telephony applications.

Positioning of wireless technologies for Residential Voice and Data Access

Access ports	Europe & other DECT countries		The US and Canada	
	Real time services	Best effort services	Real time services	Best effort services
PSTN / ISDN Telephony	DECT	–	CT0,US-CT900 DECT ISM*	–
Voice band modems	DECT	DECT 802.11b	DECT ISM* (US-CT900)	DECT ISM* 802.11b
ADSL	DECT	802.11b DECT	DECT ISM* (5 GHz WLAN)	802.11b DECT ISM*
Satellite / CATV / Fibre	(5 GHz WLAN)	802.11b	(5GHz WLAN)	802.11b

*** Standard DECT is allowed in 900, 2400 and 5800 MHz ISM bands after May 2002**

Service Requirements for Enterprise Technologies (1)

- **Telephony service:**

  The speech telephony service is still the most important service for wireless enterprise offerings.

  Requirements: Telephony quality, mobility within the whole local enterprise and between buildings, seamless handover, high capacity-up to 10.000 Erlang/sqm (equals one 0.2E user / 20 sqm).

  Requires some protection of the spectrum. For example, the popular unprotected 2.4 GHz ISM band is not suitable for enterprise voice services.

Service Requirements for Enterprise Technologies (2)

- **Low data rate services:**
  Paging, Short message services, Group calls, Automatic alarms, Supervision, Telemetry, Data collection (bar code readers). Several of these services are easily received and handled in a handset.

- **Medium data rate services:**
  WAP, MMS, Video telephony, DPAs, Laptop PCs (low number). Voice Streaming (presently not important).

- **High data rate services:**
  General PC access (laptops mainly).

Main Wireless Enterprise Technologies

Technology	Main application
DECT & PWT	Enterprise high quality voice and medium data rate pico-cell mobility services on a protected spectrum available in most countries of the world (PWT in the US on 1920-1930 MHz)
DECT900 **(new)**	Standard DECT on the US ISM band (e.g. 902-928 MHz is unprotected, but no interference from microwave ovens, Bluetooth or WLAN)
US-CT900	Voice and medium data rate pico-cell mobility services on the (unprotected) US 902-928 MHz ISM band
Cellular	Cellular coverage of enterprises will mainly be made from outdoor macro-cellular networks, where the core network services sometimes are complemented by Centrex/VPN functions.
Cellular DAS	Public hot spots as airports and large shopping centres are sometimes are provided with indoor distributed antenna systems, DAS, for multi-operator and multi-technology public access.
WLAN	Wireless pico-cell access to Ethernet LAN best effort data services. World-wide 2.4 GHz (& 5 GHz) ISM band unprotected spectrum

Wireless Enterprise Services mapped on WLAN, DECT and Cellular phones

Wireless Enterprise Services	802.11b	DECT	Cellular phones
Properties	Unprotected spectrum Local radio network Partial/Full coverage	Protected spectrum Local radio network Full coverage	Protected spectrum External radio network Maybe marginal coverage
Voice calls	–	**X**	X
Paging, Group calls Supervision, Alarms	–	**X**	–
Laptops / PDAs	**X**	X	x
Telemetry inventory	X	X	–
SMS, WAP, MMS	–	X	X

Main arguments for choosing DECT for Enterprise

- Advantages of being Mobile on the premises at zero cost
- Cost of ownership
- Re-location cost (Changing project teams)
- Reach-ability and efficiency
- Reliable, own frequency band, not disturbed by others
- Industry standard, interoperable
- Integrate main processes in the IT structure

Summary of Main Applications and Potential Evolution (1)

	Personal Area & Short Cord replacement	Local Area		Wide area (Indoor&outdoor coverage from outdoor cells)
		Single cell	Multi-pico-cell with handover	
Voice & voice band data <9.6, 32 or 64 Kbps	Bluetooth DECT	**DECT**	**DECT**	**Cellular 2G+/3G technologies**
Best effort Data <0.5 - 1 Mbps	**Bluetooth** DECT	**802.11b DECT**	DECT	Cellular 2G+/3G technologies
Best Effort data >1 MBps	**802.11b**	**802.11b**	–	–
Real Time Streaming Data <05. - 1 Mbps	DECT Bluetooth	802.11b	DECT	Cellular 3G technologies
Real Time Streaming Data > 1MBps	(5 GHz WLAN)	(5GHz WLAN)	–	–

Legend: non underlined: suitable technology // underlined: used in the market

Summary of Main Applications and Potential Evolution(2)

- **Residential applications:**
  DECT will continue to be the dominant mass market cordless residential technology *for several years*.
  The presently dominating voice service will to larger extent be complemented by high quality medium rate data services.
  Access (since May 2002) for standard DECT on the US 902-928 MHz ISM band and the 2.4 GHz and 5.8 GHz bands opens the US market for DECT residential applications.
- **Enterprise applications:**
  DECT will continue to be the dominant unlicensed enterprise voice and data mobility technology *for several years*.
  In the US, besides the present DECT derivative PWT (1920-1930 MHz), we will see enterprise applications on the US 902-928 MHz ISM band (no interference from microwave ovens, Bluetooth or WLAN application).

continues...

Summary of Main Applications and Potential Evolution(3)

- **Combined voice and data applications**
  One strength for DECT is the unique capability to effectively combine high quality voice telephony and high quality medium rate data services in the same base stations.
  This strength has not yet been fully utilised by existing products.
- **Data only control and telemetry applications**
  An increasing application area is the use of DECT as a mature technology to solve control, supervision and telemetry needs within various products and systems.
- **Personal Area applications**
  DECT is also as technology suitable for Personal Area Networks, PAN, and short range cord replacement applications. It is however uncertain if these applications for DECT will ever pass a niche market position, due to earlier lack of easily accessible US spectrum and the momentum for Bluetooth, having PAN and short range cord replacement as main applications.

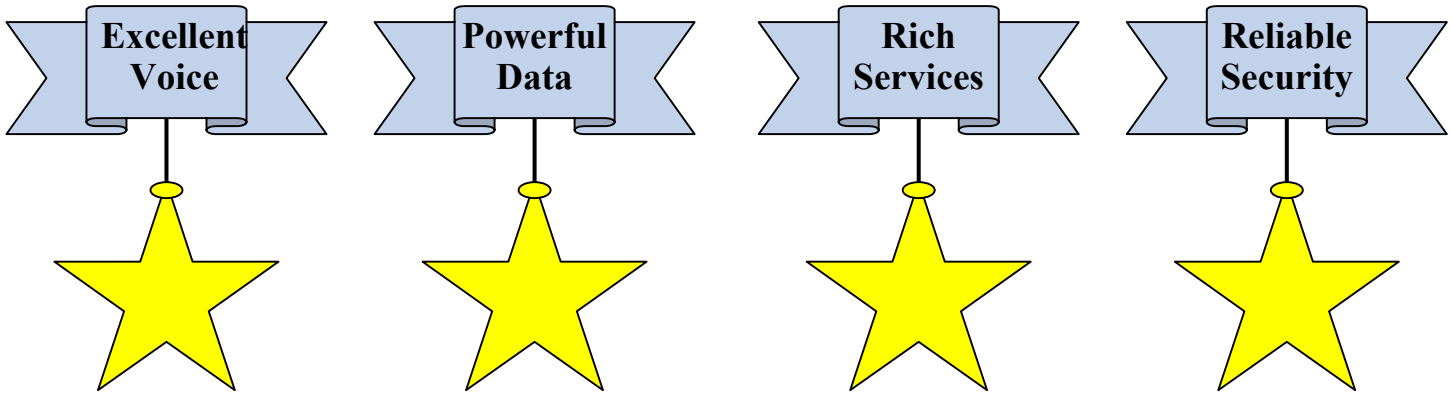
Comparing absolute Link Budgets and Range on an Office Floor

Device	Tx power	Rx sensitivity	Fading margin	Diversi-ty gain	Body loss	Link budget	Range [m]
DECT speech	24 dBm	-90 dBm	19 dB	10 dB	10 dB	95 dB	37 (42)
DECT data	24 dBm	-90 dBm	9 dB	5 dB	10 dB	100 dB	44 (59)
WLAN 11 Mbps	15 dBm	-80 dBm	9 dB	5 dB	10 dB	81 dB	19 (15)
WLAN 1 Mbps	15 dBm	-90 dBm	9 dB	5 dB	10 dB	91 dB	30 (28)
Bluetooth speech	0 dBm (15 dBm)	-85 dBm	19 dB	No	10 dB	56 dB (71 dBm)	1 room 10 (8)
Bluetooth data	0 dBm (15 dBm) (20 dBm)*	-85 dBm	9 dB	No	10 dB	66 dB (81 dB) (86 dB)*	7 (5.5) 19 (15) 24 (21)*

- Range ( ) comparison is made for two different propagation models. Interference on the unprotected 2.4 GHz ISM band could further limit range for Bluetooth and WLAN.
- The Tx power is the typical power with which products typically operate
  *: 20dBm Tx power is unlikely because Bluetooth module has to be very small, very inexpensive and take very little current, WLAN also allows 20dBm but typically uses 15dBm max.

Digital Enhanced Cordless Telecommunications DECT

1992 - 2002



10 Year Celebration