

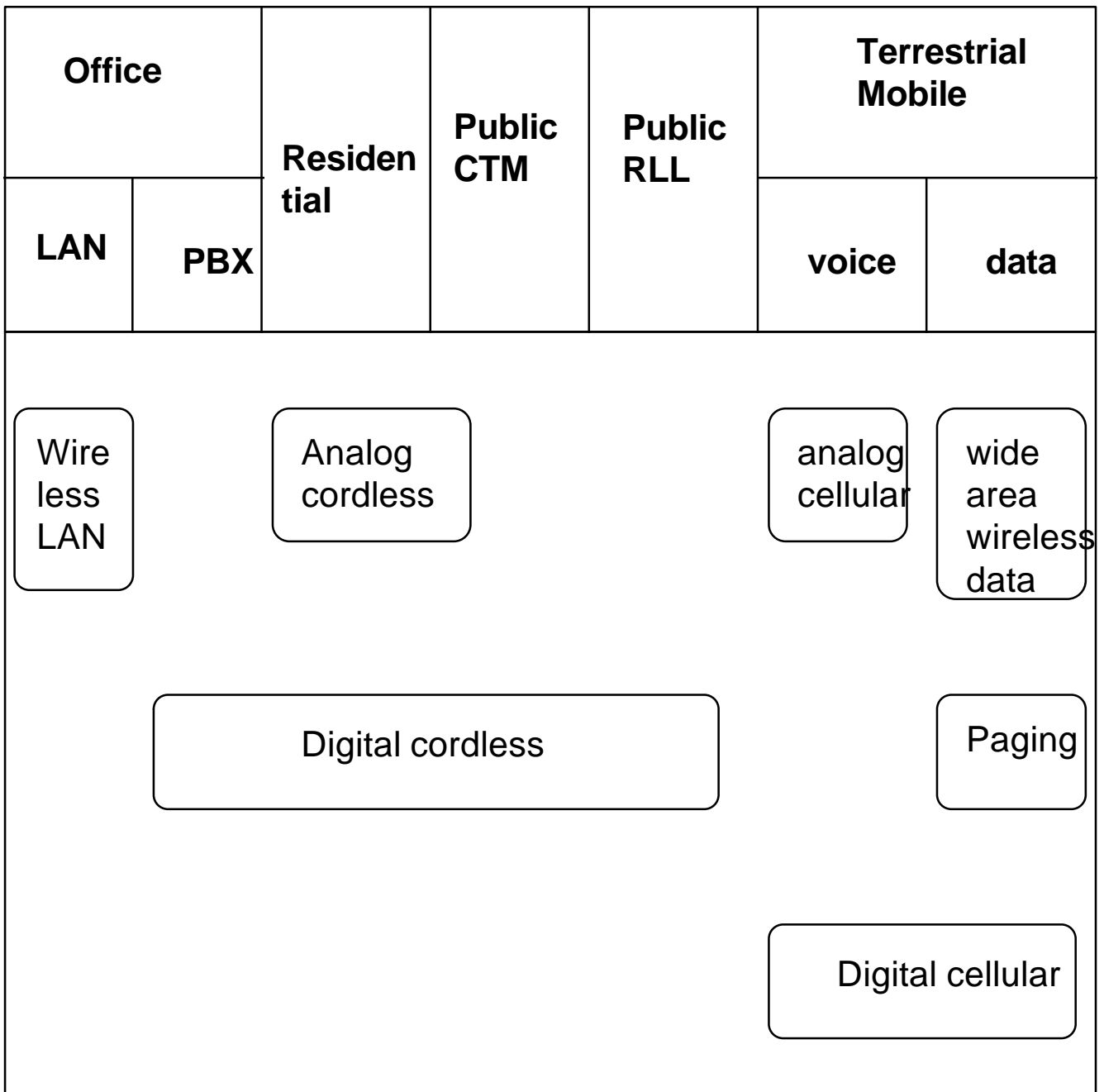
# Cellular and Cordless Radio Technologies

- First generation technologies
- Second generation technologies
- Third generation technologies  
(future concepts)

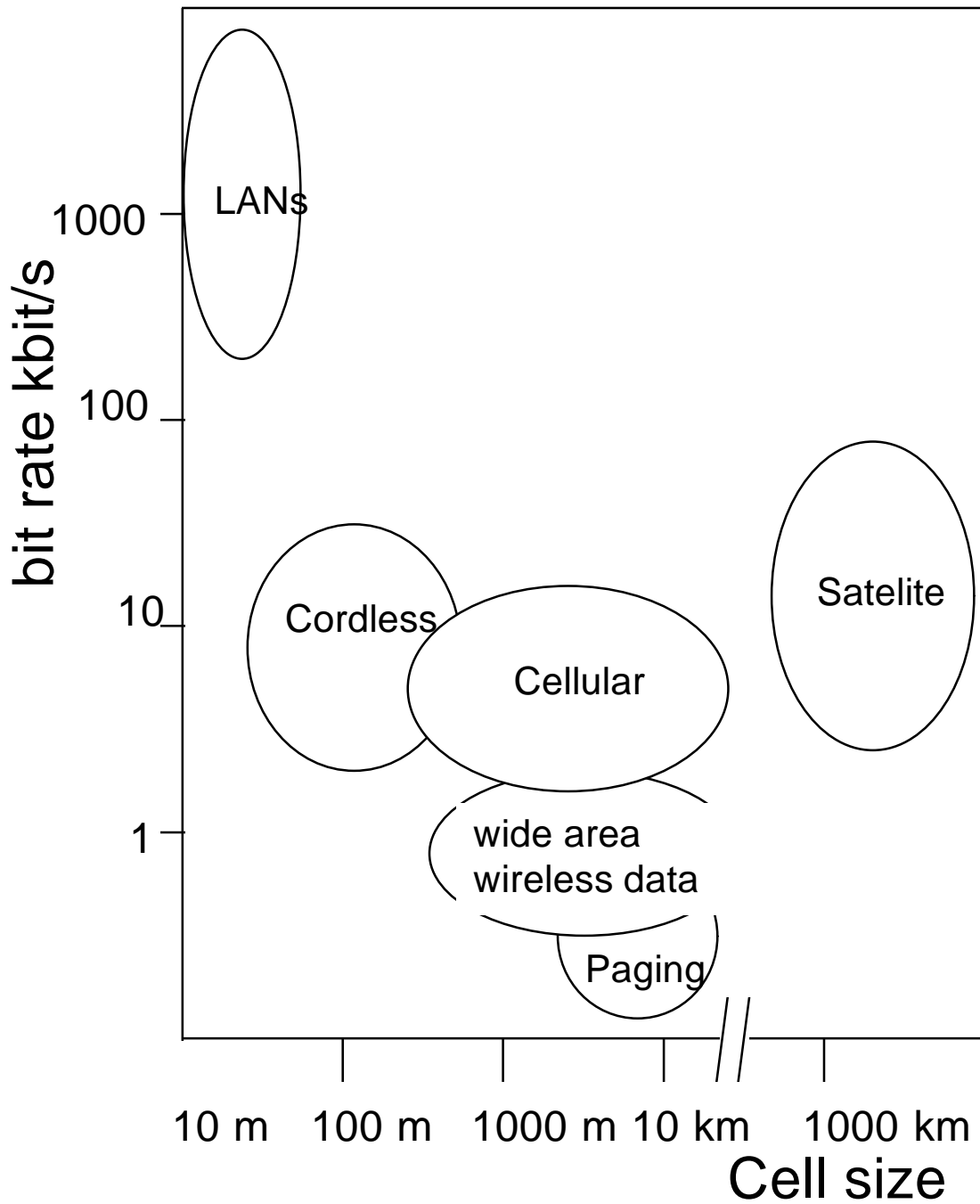
# Wireless Personal Communications

- Cellular
- Cordless
- Paging
- Wide area wireless data
- Wireless LAN's
- Satellite

# Wireless applications



## Wireless Technologies - bit rate and cell size



# First generation analog *cellular* technologies

## Systems

- AMPS
- NMT
- TACS
- NTT
- ...

## Characteristics

- analog FM speech
- FSK signalling
- FDMA/FDD
- cell sizes 0.5-10 km
- mobile power 1W-8W
- frequency reuse
- handover

# First generation analog *cordless* technologies

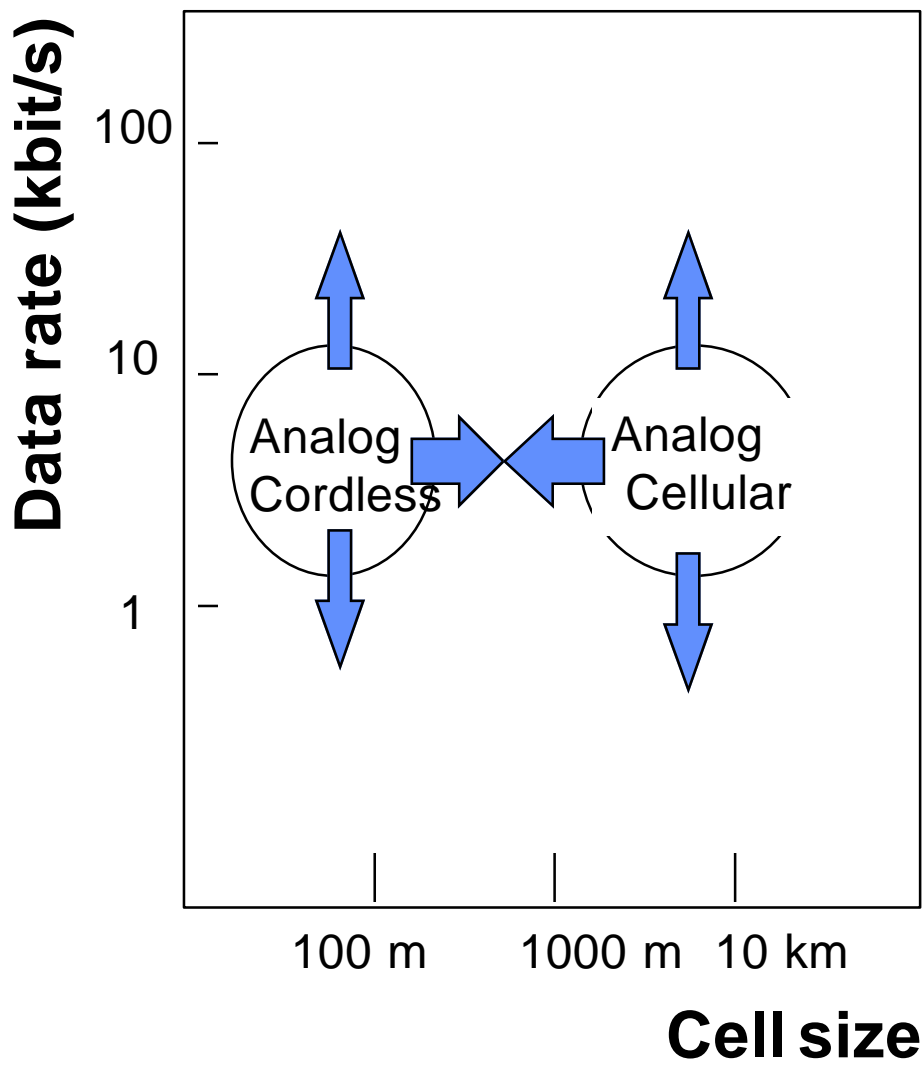
## Systems

- US cordless
- MPT1322 (“CT0”)
- CEPT/CT1
- NTT
- ...

## Characteristics

- analog FM speech
- FSK signalling
- FDMA / FDD
- mainly residential
- low power ( $\ll 1\text{W}$ )

# First generation cordless/cellular technology positioning



## **Second generation digital cellular technologies**

- GSM-type
  - GSM (Europe, TDMA)
  - DCS 1800 (Europe, similar to GSM)
  - PCS 1800 (US)
- Digital AMPS: IS-54 in US (TDMA)
- Cellular CDMA: IS-95 in US
- PDC (Japan, TDMA)



	GSM	DCS1800	IS54	IS95	PDC
Where	Europe, Australia, Asia	UK, Germany	US	US	Japan
Multiple Access	TDMA	TDMA	TDMA	CDMA	TDMA
Frequency band (MHz)	890-915 935-960	1710-1785 1805-1880	824-849 869-894	824-849 869-894	810-826 940-956 1429-1453 1477-1501
Modulation	GMSK	GMSK	$\pi/4$ DQPSK	BPSK/ QPSK	$\pi/4$ DQPSK
RF carrier spacing	200 kHz	200 kHz	30 kHz	1250 kHz	25 kHz
Channel bit rate kbit/s	270.833	270.833	48.6	1288/9.6	42 kbit/s
Speech channels/carrier	8	8	8	?	8

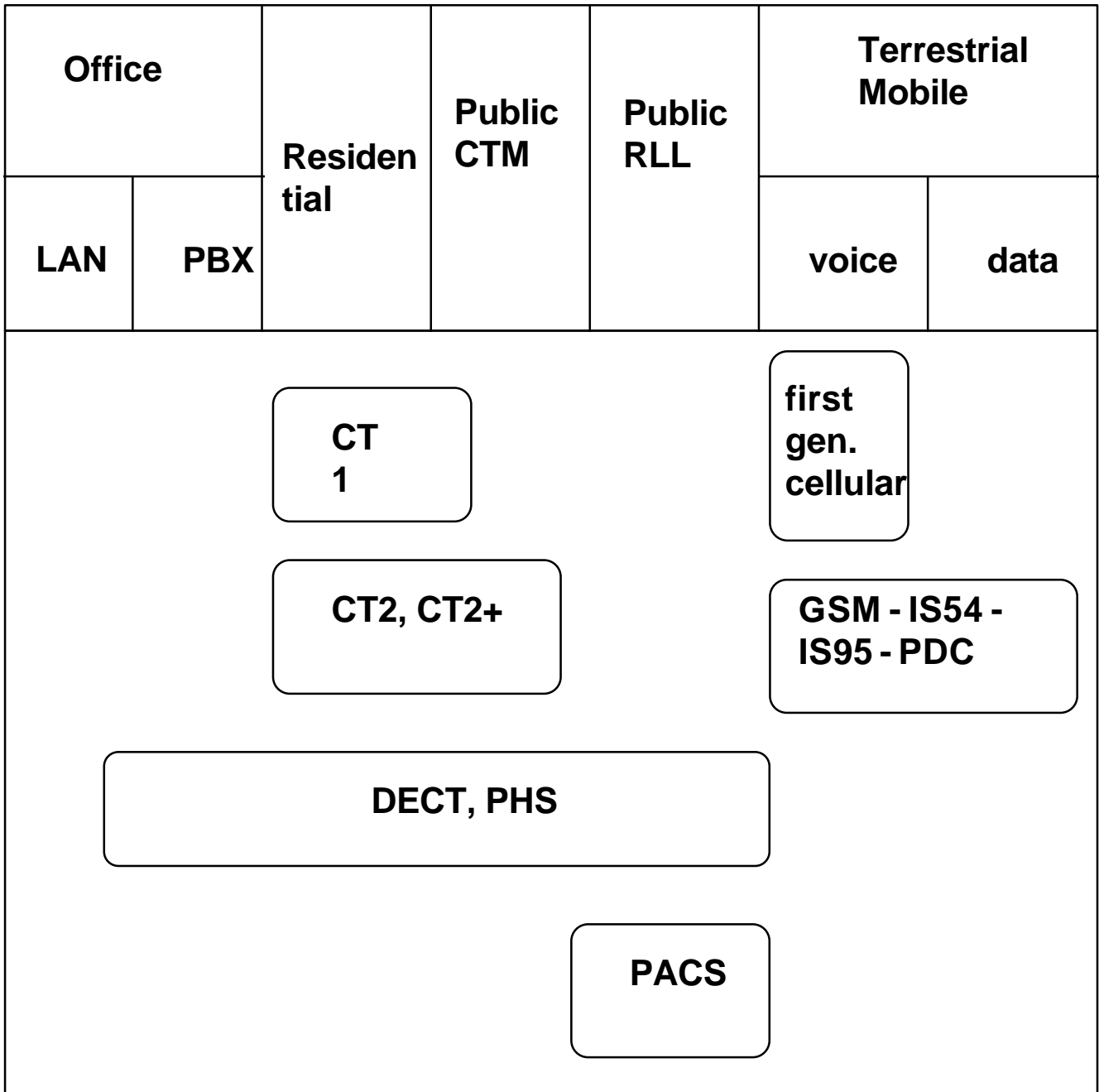
## **Second generation digital cordless technologies**

- CT2 (FDMA/TDD)
- CT2+ (CT2 + mobility)
- DECT (TDMA/TDD; Europe)
- PHS (TDMA/TDD; Japan)
- PACS (TDMA/FDD; US)
- ISM band digital cordless

# Second generation digital cordless technologies

	CT2	CT2+	DECT	PHS	PACS
Region	Europe	Canada	Europe	Japan	US
Duplexing	TDD	TDD	TDD	TDD	FDD
Frequency band	864-868	944-948	1880-1900	1895-1918	1850-1910 1930-1990
Carrier spacing	100	100	1728	300	300/300
Channel bit rate	72	72	1152	384	384
Modulation	GFSK	GFSK	GFSK	$\pi/4$ DQPSK	$\pi/4$ DQPSK
Average TX power	5	5	10	10	25
Number of carriers	40	40	10	77	16 pairs

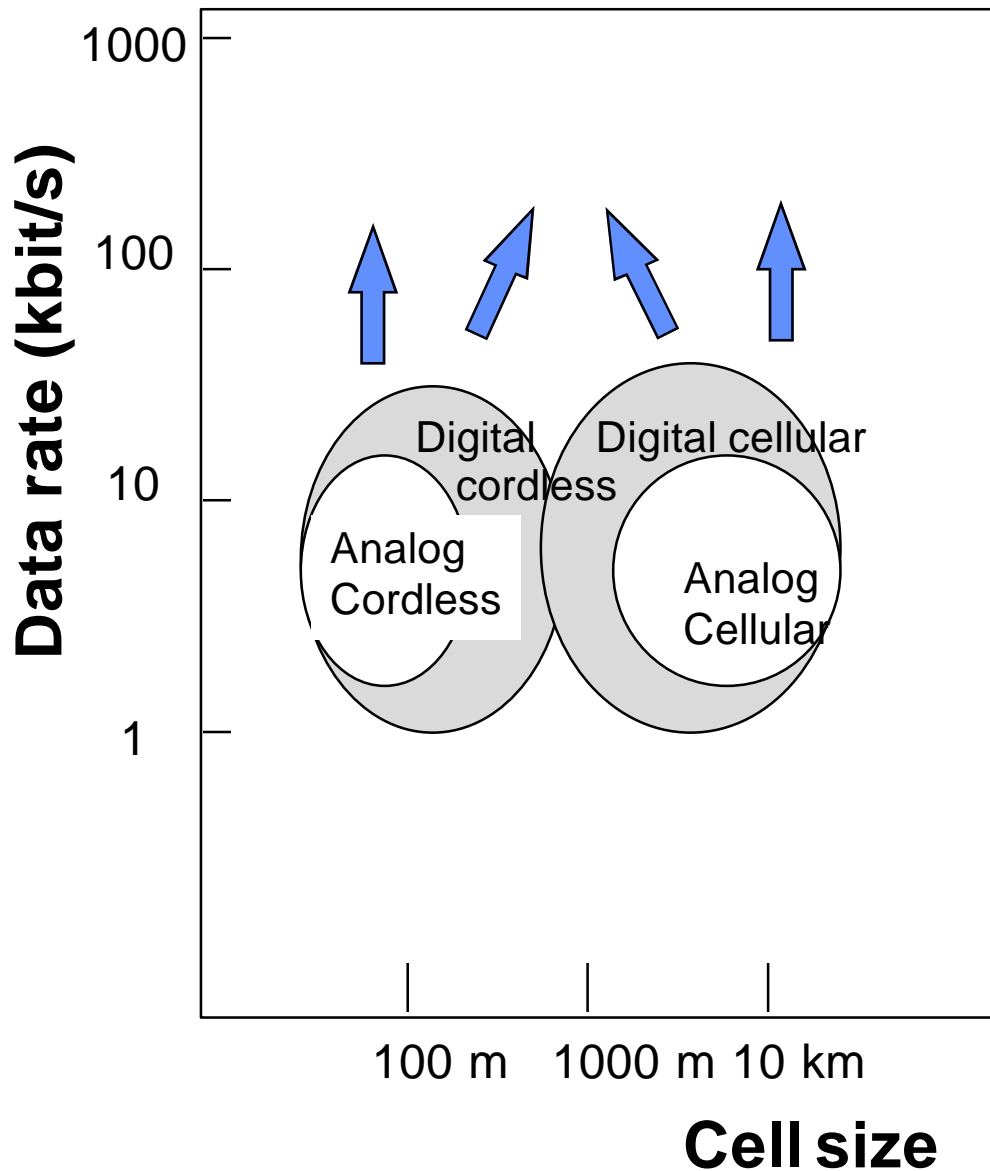
# Wireless Applications



## Cordless versus cellular

	<b>Cellular</b>	<b>Cordless</b>
<b>Cell size</b>	<b>Large (0.5-30 km)</b>	<b>Small (50-500 m)</b>
<b>Mobility speed</b>	<b>High (up to 150 km/h)</b>	<b>Low (less than 6 km/h)</b>
<b>Coverage</b>	<b>Wide area</b>	<b>Zonal</b>
<b>Handset complexity</b>	<b>Moderate</b>	<b>Low</b>
<b>Base complexity</b>	<b>High</b>	<b>Low</b>
<b>Handset TX power</b>	<b>High (100mW-600mW)</b>	<b>Low (5-10 mW)</b>

## Second generation cordless/cellular technology positioning



# Future Technologies (Third generation)

## **Some objectives:**

- Provide a seamless radio infrastructure
- Customer should see services, not technology!
- Maximize commonality of radio interfaces
- Enable cost-effective dual mode operation
- Universal personal mobility
- Evolution from 2nd generation technologies