

TEKNIK PERANCANGAN JARINGAN AKSES SELULER



Pengenalan Jaringan
Nirkabel dan Seluler



by : Dwi Andi Nurmantris

KLASIFIKASI WIRELESS

Wireless Communication	Fixed Wireless	Non Cellular	contoh : point to point communication, infra red communication, LMDS (Local Multipoint Distribution Service), Microwave communication
		Cellular	contoh : PHS, CT2, PACS, DCS1800, DECT
	Mobile Wireless	Non Cellular	contoh : paging system (ERMES, NTT, NEC) , dispatching system, PAMR (<i>Public Access Mobile Radio</i>) dsb
		Cellular	contoh : GSM, CDMA/IS-95, AMPS, UMTS, PHS, DCS1800, NMT450, TACS, C-450, dsb

SISTEM KOMUNIKASI BERGERAK

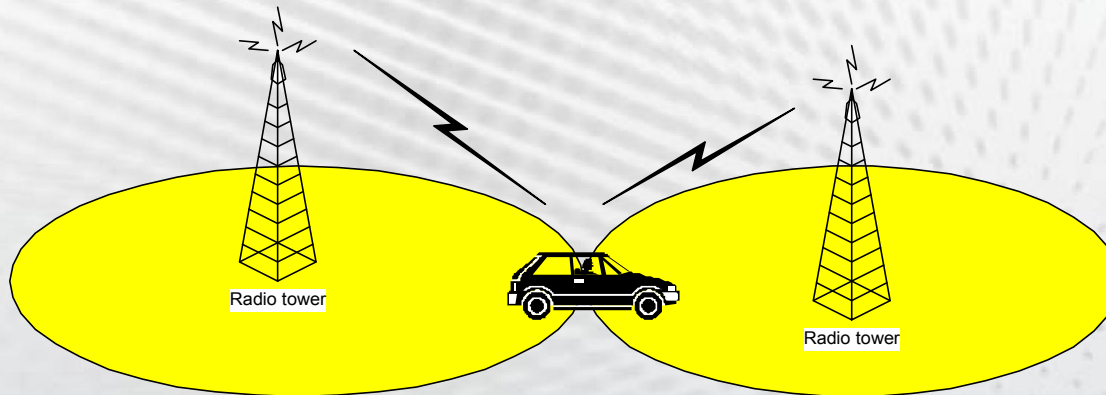
Syarat

Ada sedikitnya satu terminal bergerak di dalam komunikasi

Pada awalnya

- ✓ Daya pancar tinggi
- ✓ Antena setinggi-tingginya
- ✓ Cakupan sel sebesar-besarnya
- ✓ Konsep Handoff tidak ada

GENERASI AWAL SISTEM KOMUNIKASI BERGERAK

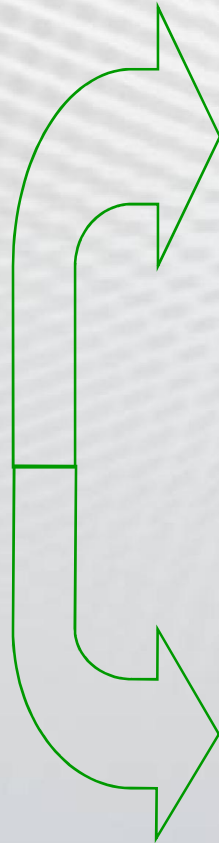


Kelemahan

- ✓ Biaya mahal karena perlu penguat daya tinggi dan antena tinggi
- ✓ Kenyamanan pelanggan terganggu saat berpindah cakupan
 - ✓ Kapasitas rendah
 - ✓ Efisiensi spektrum rendah

PERKEMBANGAN SISTEM KOMUNIKASI BERGERAK

Sistem
Komunikasi
bergerak



Satelit

- 🚀 **GMPCS** (Global Mobile Personal Communication System)
- 🚀 Iridium, Globalstar

Terrestrial

- 🚀 **Siskomber Selluler**

KLASIFIKASI SISTEM SELULER

Menurut Daerah Jangkauan (Coverage)

1. Large Zone (Single Cell/Conventional).
 - * Radius +/- 20 miles.
2. Multi Zone (Cellular).
 - * STB (NMT, GSM, CDMA)
3. Global System (Mobile Satellite).
 - * Iridium, Globalstar, GMPCS

Menurut Sistem Transmisi yang digunakan

1. Menggunakan Transmisi Terrestrial.
 - * Radio Terrestrial (VHF/UHF).
 - * Single Cell Conventional & Cellular.
2. Menggunakan Transmisi Satellite.
 - * Iridium , Globalstar, GMPCS

STANDARD SISTEM SELULER

Sistem Seluler Analog – Generasi Pertama

- ❖ AMPS (Advanced Mobile Phone System)
- ❖ NMT 450 (Nordic Mobile Phone)
- ❖ TACS (Total Access Communication System)

Sistem Seluler Digital – Generasi Kedua

- ❖ GSM (Global System for Mobile Communication)
- ❖ DAMPS (Digital AMPS)
- ❖ CDMA/IS-95

Generasi Ketiga

- ❖ IMT 2000

TEKNOLOGI SELULER

1G wireless

AMPS (Advanced Mobile Phone Service)

- Analog voice service
- No data service

2G wireless

CDMA (Code Division Multiple Access)

TDMA (Time Division Multiple Access)

GSM

(Global System for Mobile
Communications)

PDC (Personal Digital Cellular)

- Digital voice service
- 9.6K to 14.4K bit/sec.
- CDMA, TDMA and PDC offer one-way data transmissions only
- Enhanced calling features like caller ID
- No always-on data connection

3G wireless

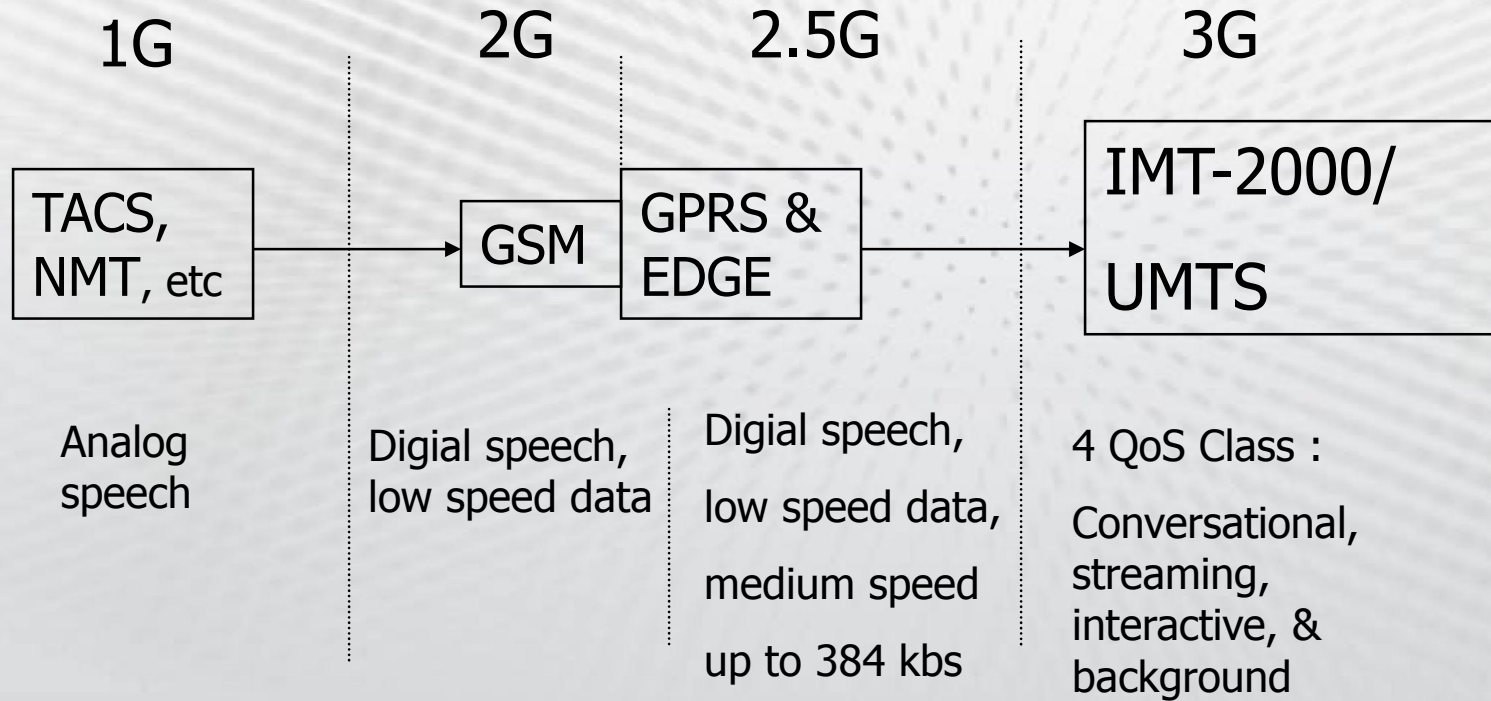
W-CDMA

(Wide-band Code Division Multiple
Access)

CDMA-2000

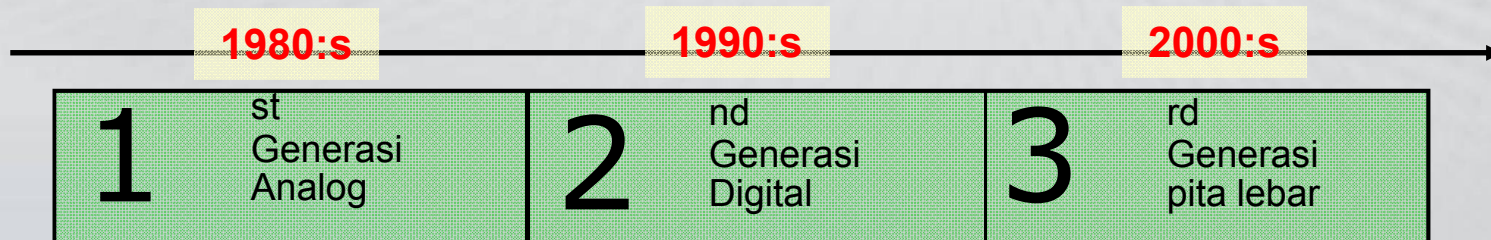
- Superior voice quality
- Up to 2M bit/sec.
- always-on data
- Broadband data services like video & multimedia
- Enhanced roaming

SELULER EVOLUTON → EUROPEAN WAYS



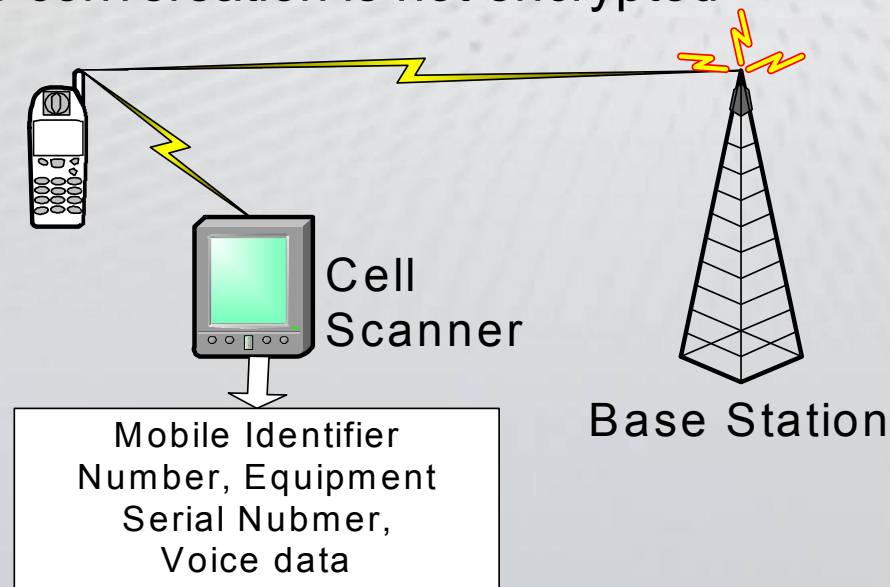
2G VS 3G

	2G	3G
Layanan	Suara+ Low data rate	Aplikasi Multimedia
Kapasitas Transmisi	22,8 kb/s	2 Mb/s
Switching/ Routing	Circuit	Packet
Pentarifan	Time and Location based	Volume Based



ADVANCED MOBILE PHONE SERVICE (AMPS)

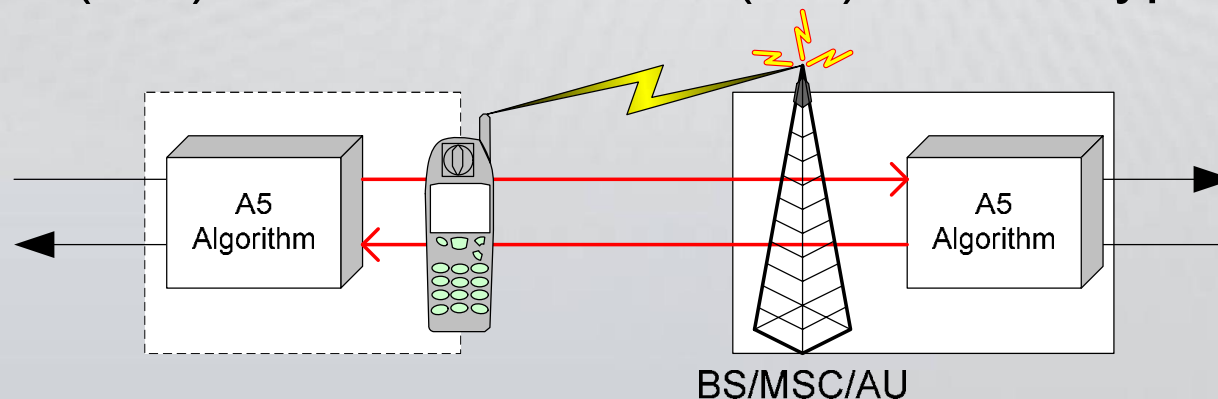
- Pioneer of cellular telecommunications
- FDMA-based analog system
 - Low capacity of subscriber per cell
- Unsecure
 - Phone number can be scanned and copied
 - Voice conversation is not encrypted



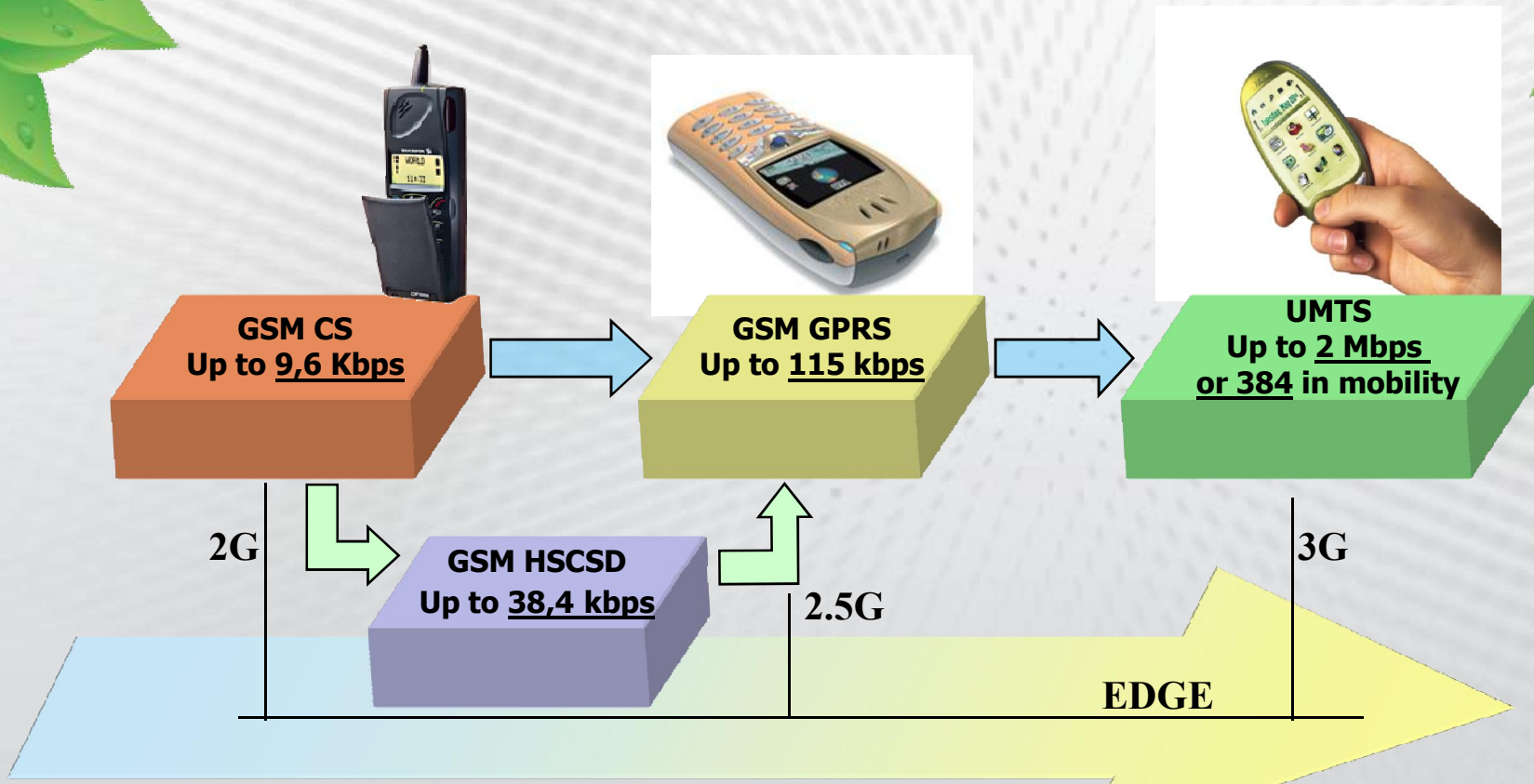
GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

- The most popular of cellular technologies
Supported in nearly all countries
- TDMA-based digital system
8 times capacity of AMPS per frequency band
- Secure

All information exchange between Mobile Station (MS) and Base Station (BS) are encrypted

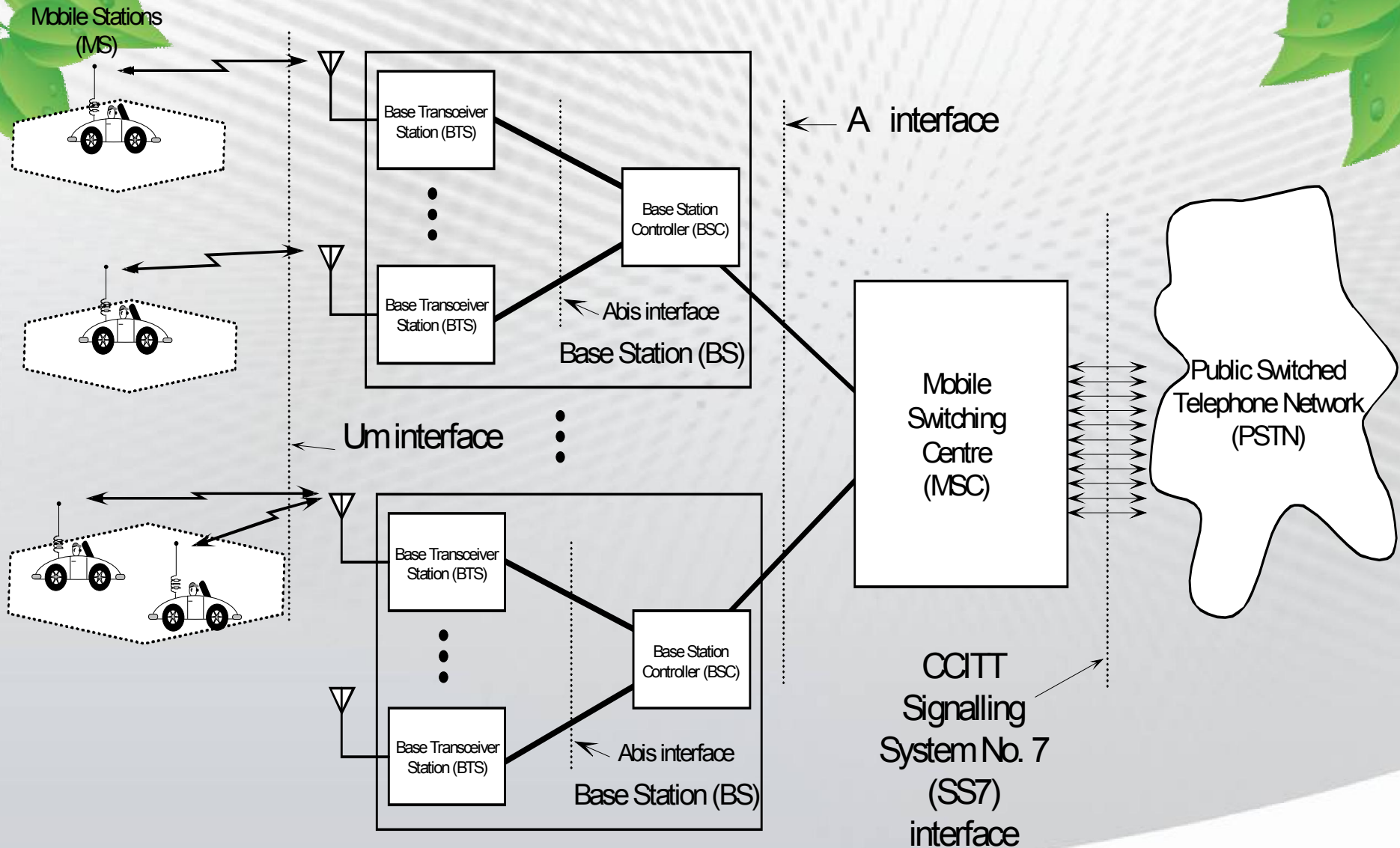


GSM EVOLUTION



Operators prefer choose direct going to GPRS technology rather than going to GSM HSCSD technology because no HSCSD handset availability and short time stage

CELLULAR SYSTEM ARCHITECTURE





CDMAone

- Newest cellular phone standard
 - Developed by Qualcomm
 - Supported mainly in the Americas and East Asia
- CDMA-based digital system
 - Up to 18 times capacity of AMPS per frequency band
- Very Secure
 - Listeners need the right descrambler key
 - Optional encryption is also available

PERBANDINGAN SISTEM KOMUNIKASI SELULER

	AMPS	GSM	CDMA/IS-95
Akses jamak	FDMA	TDMA	DS-CDMA
Modulasi	FM	GMSK	QPSK
Bandwidth RF	30 kHz	200 kHz	1,25 MHz
Kanal / carrier RF	1	8	20 – 30
Frekuensi Uplink	824 – 849 MHz	890 – 915 MHz	824 – 849 MHz
Frekuensi Downlink	869 – 894 MHz	935 – 960 MHz	869 – 894 MHz

TREN TEKNOLOGI SELULER

Syarat Pelayanan

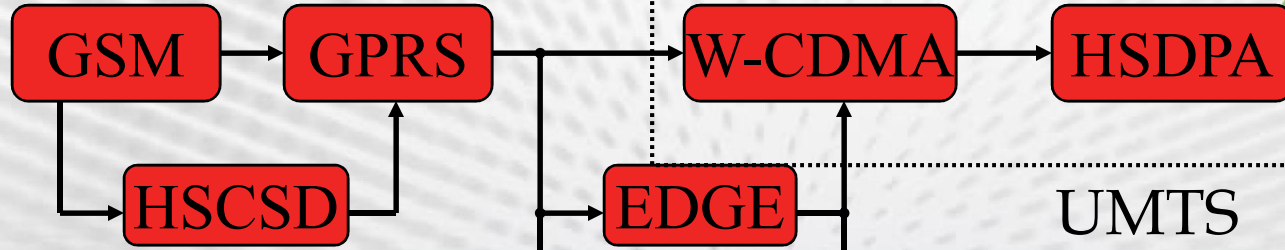
- ✓ Aplikasi multimedia baru
- ✓ Arsitektur layanan terpadu
- ✓ Layanan berbasis Internet Protocol
 - ✓ Data Kecepatan tinggi
 - ✓ Suara kualitas tinggi

Teknologi Akses

- ✓ WCDMA (Wideband Code Division Multiple Access)

CELLULAR EVOLUTION AND 3G ROADMAP

GSM
Europe



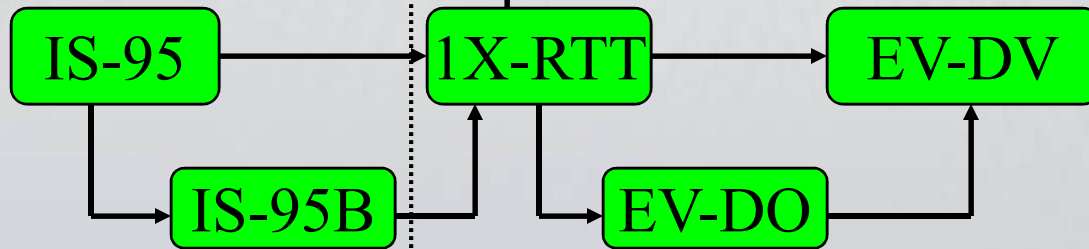
PDC
Japan



D-AMPS
North America

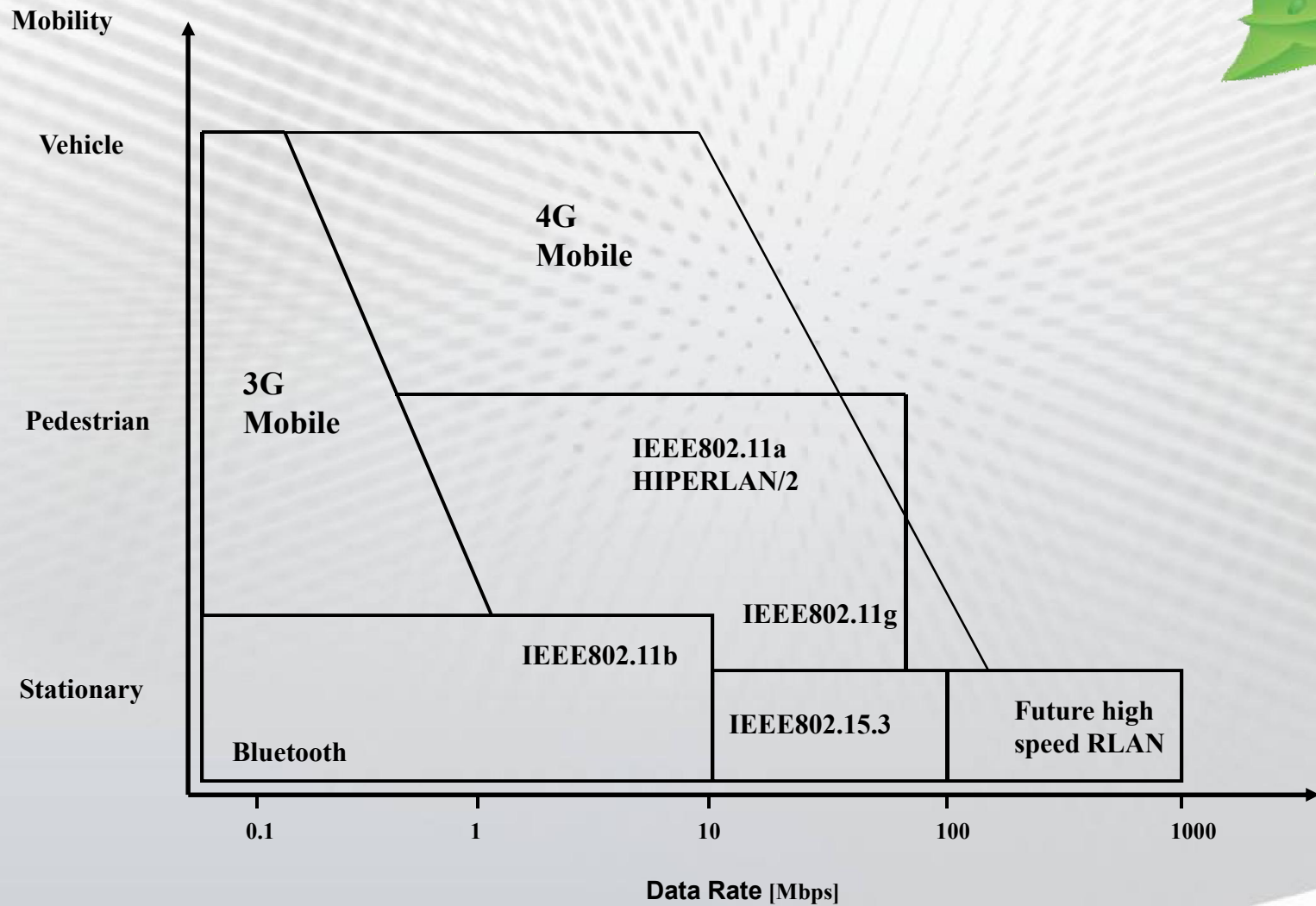


IS-95
North America

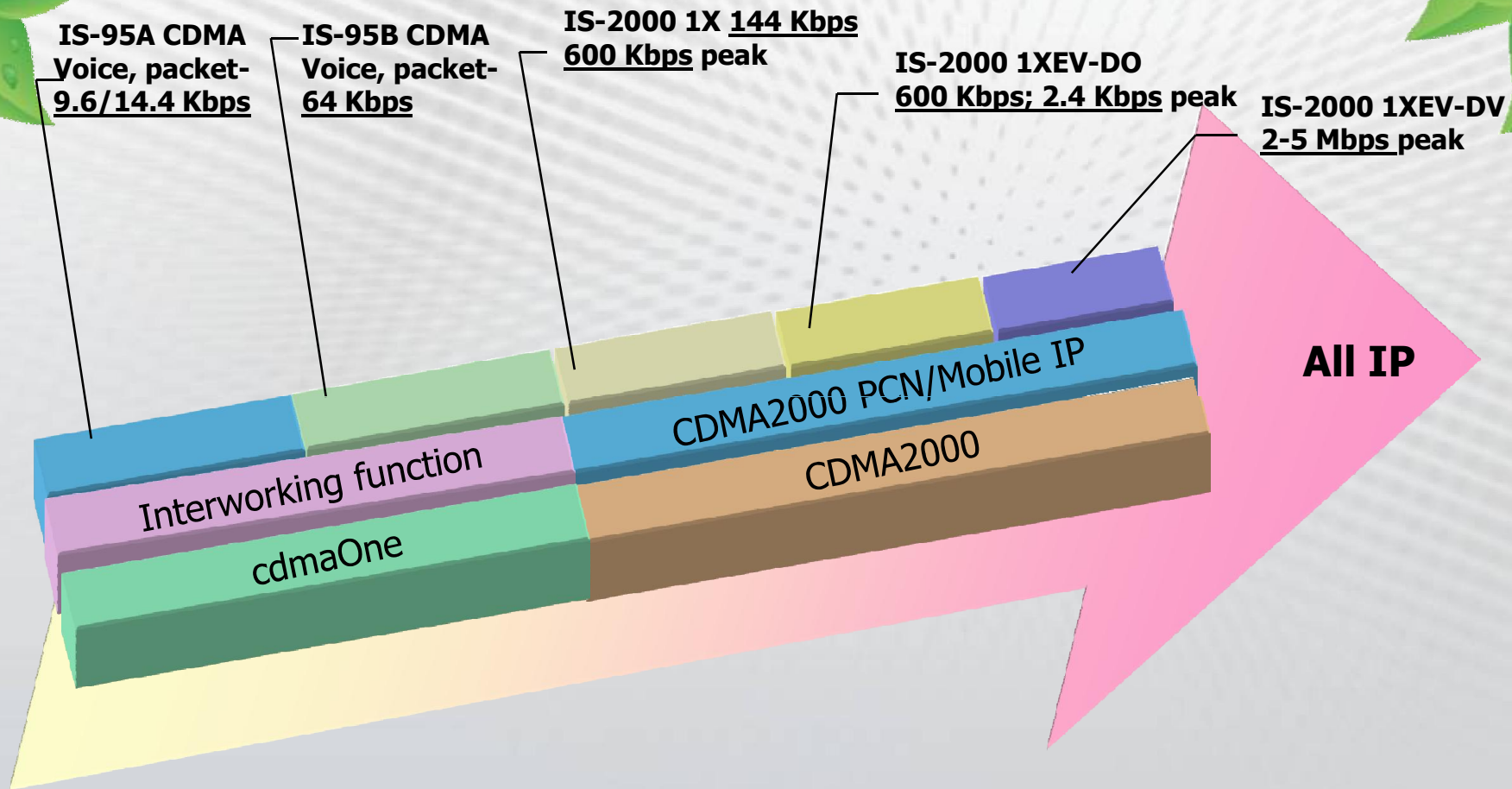


2G	2.5G	3G	3G+
9.6-14 kbps	114-384 kbps	0.384-2 Mbps	>5 Mbps

DATA RATE AND MOBILITY



CDMA STANDARDS EVOLUTION



Source: CDMA2000-A world view

IMT-2000

1G
(analog)

Paging Systems,
e.g. City Call

Cordless Telephone
e.g. CT1, 1+

wireless
Telephone cell

Private Mobile Radio
PMR

Cellular systems
e.g. C450, NMT, AMPS

MSS
e.g. INMARSAT

2G
(digital)

Paging Systems
e.g. ERMES

Cordless Telephone
e.g. DECT, PACS, PHS

Wireless
Local Loops
WLL

PMR
e.g. TETRA

Cellular systems
e.g. GSM, D-AMPS,
IS-95, PDC

MSS
e.g. IRIDIUM, ICO,
Globalstar

3G

1 family of
standards

for all

- **applications**
- **countries**



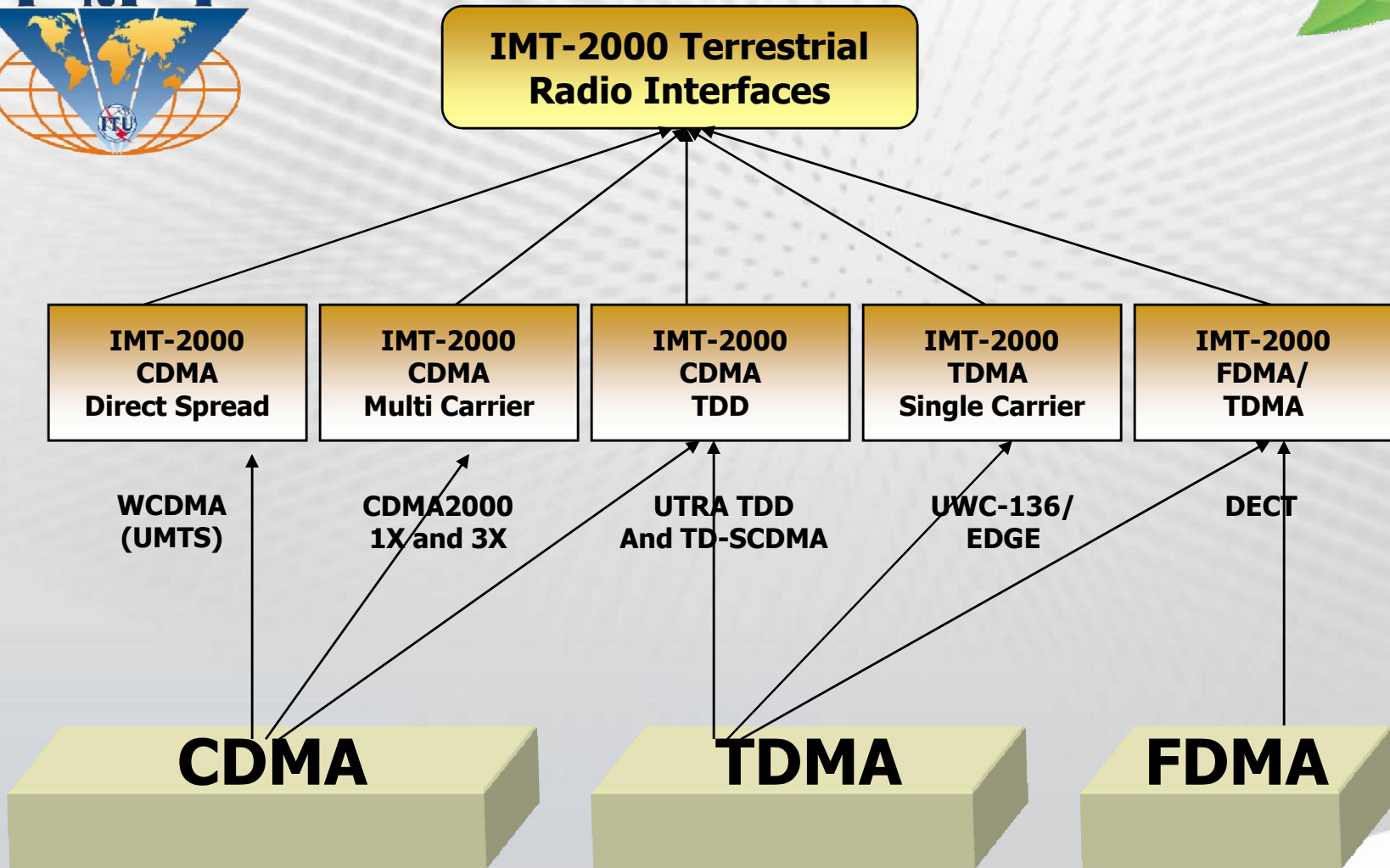
e.g. UMTS, cdma2000, UWC-136

different, incompatible standards for different applications, countries & regions

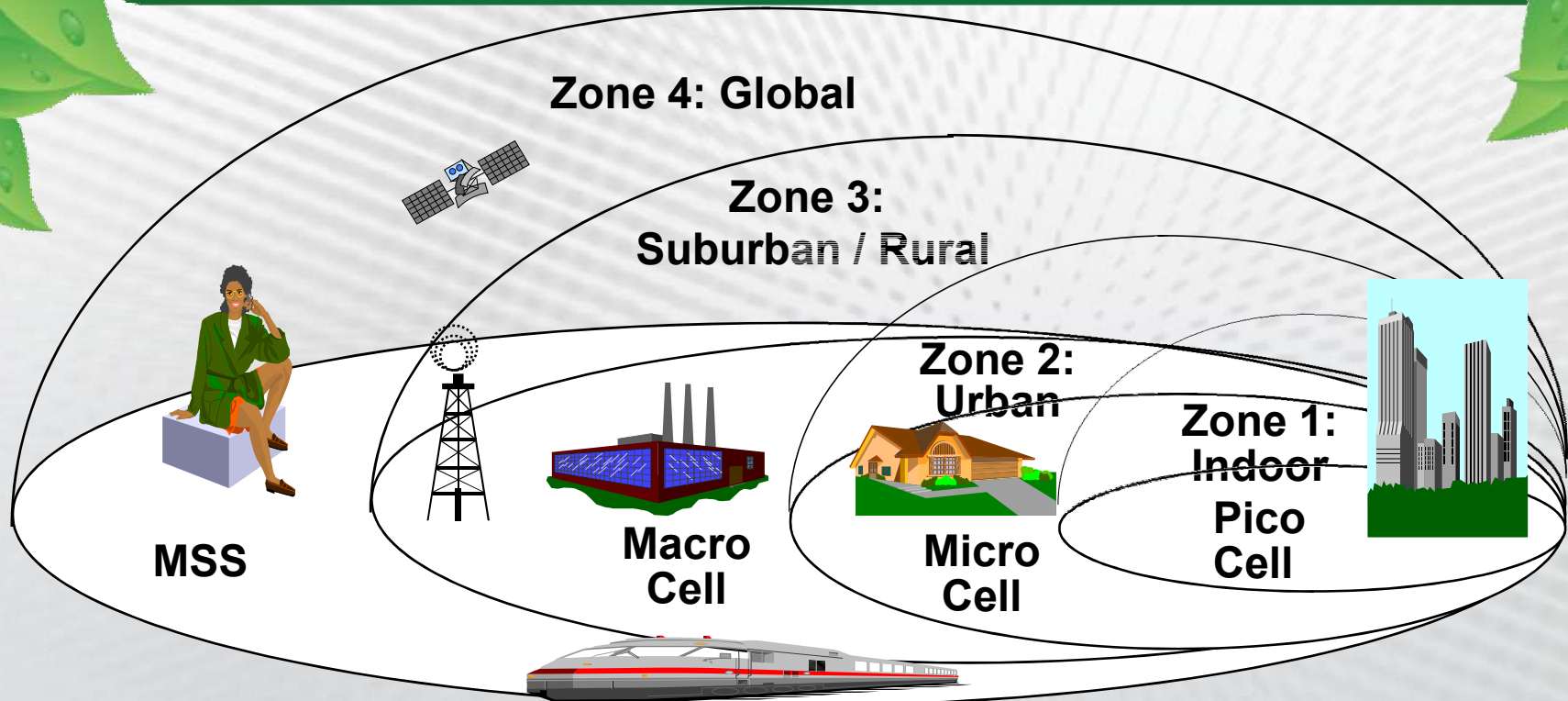
IMT-2000 (FAMILY OF STANDARDS)



IMT-2000 Terrestrial Radio Interfaces



UNIVERSAL MOBILE TELECOMMUNICATIONS SYSTEM (UMTS)



MSS

Macro Cell

Micro Cell

Pico Cell

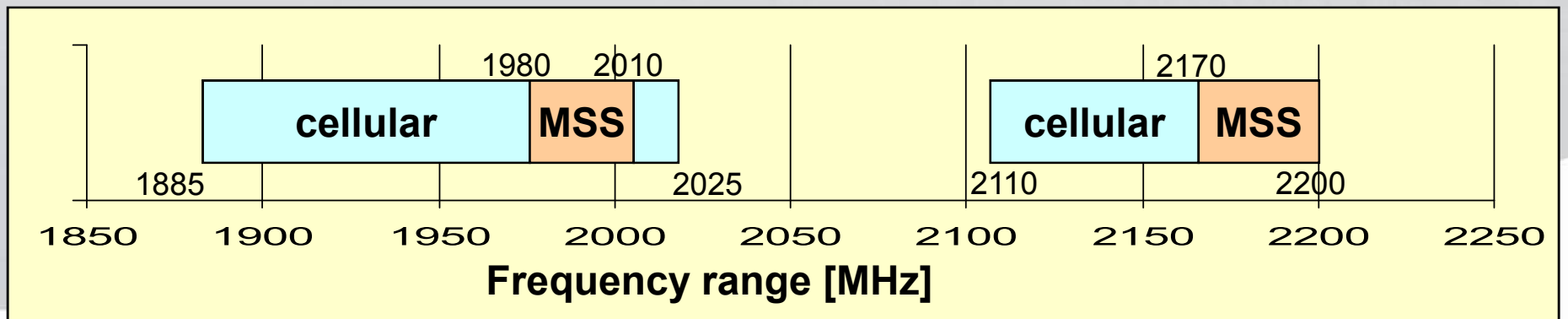
144 kbit/s

144 kbit/s

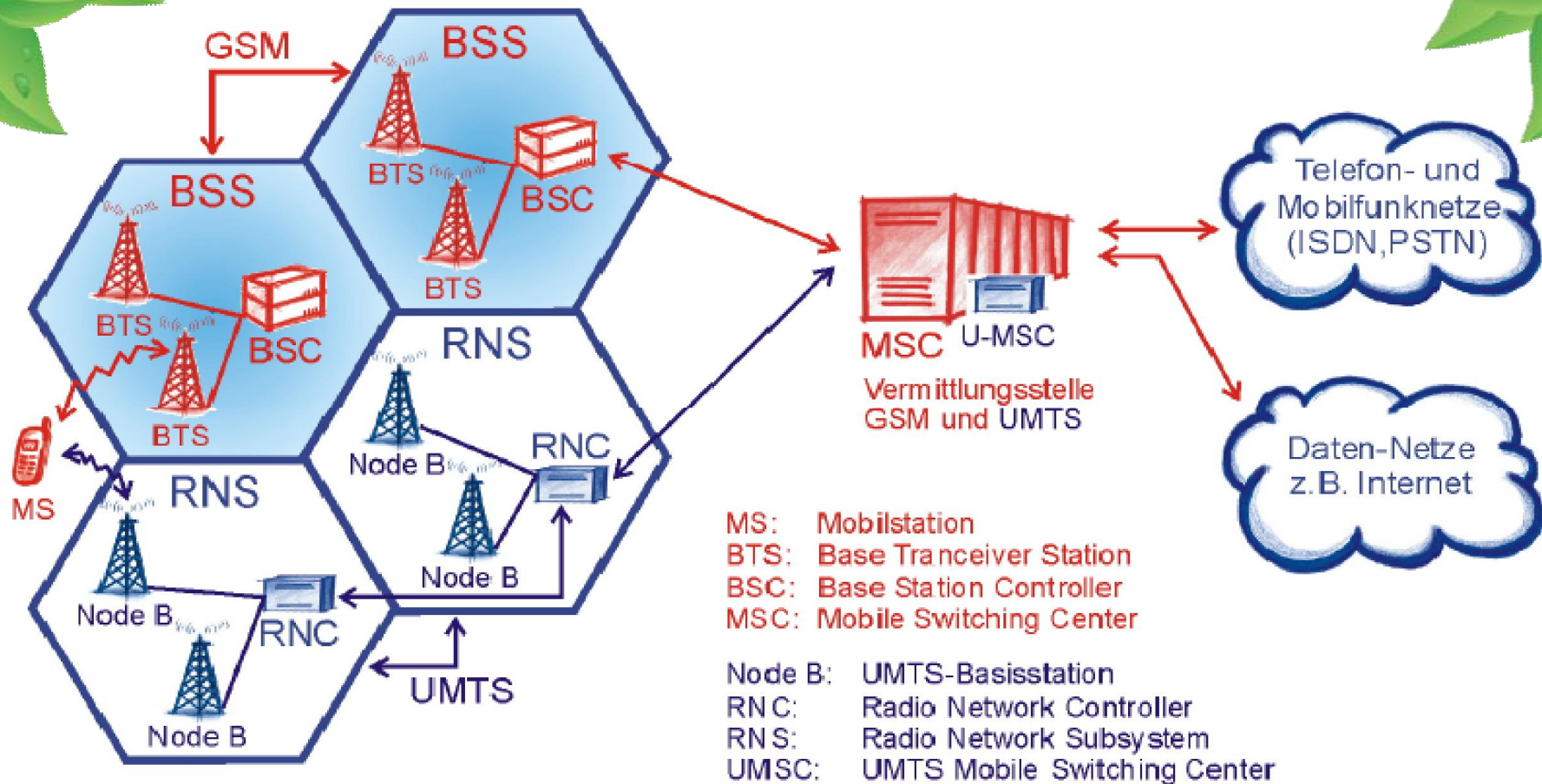
384 kbit/s

2048 kbit/s

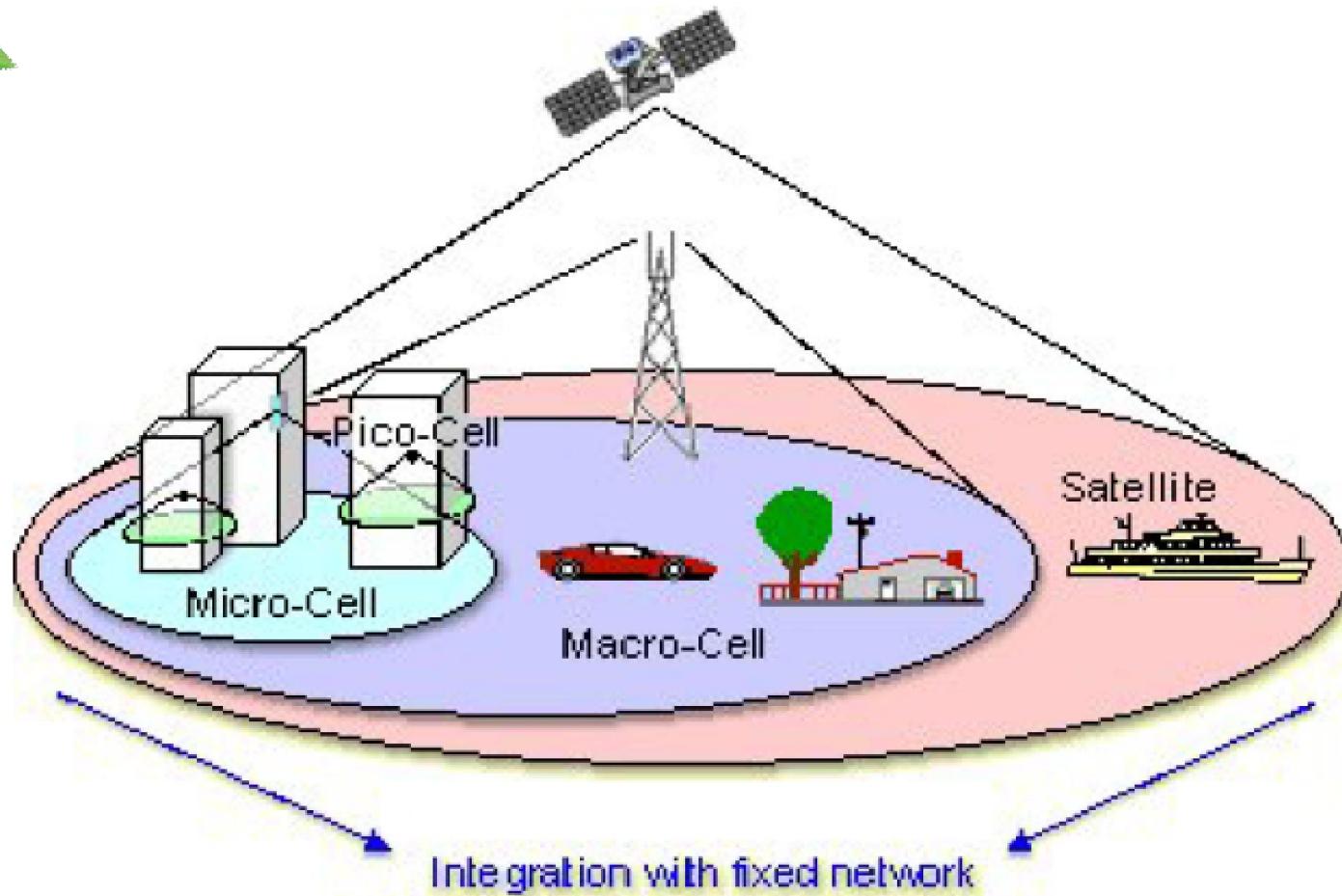
**max.
data rate**



UMTS - ARCHITECTURE



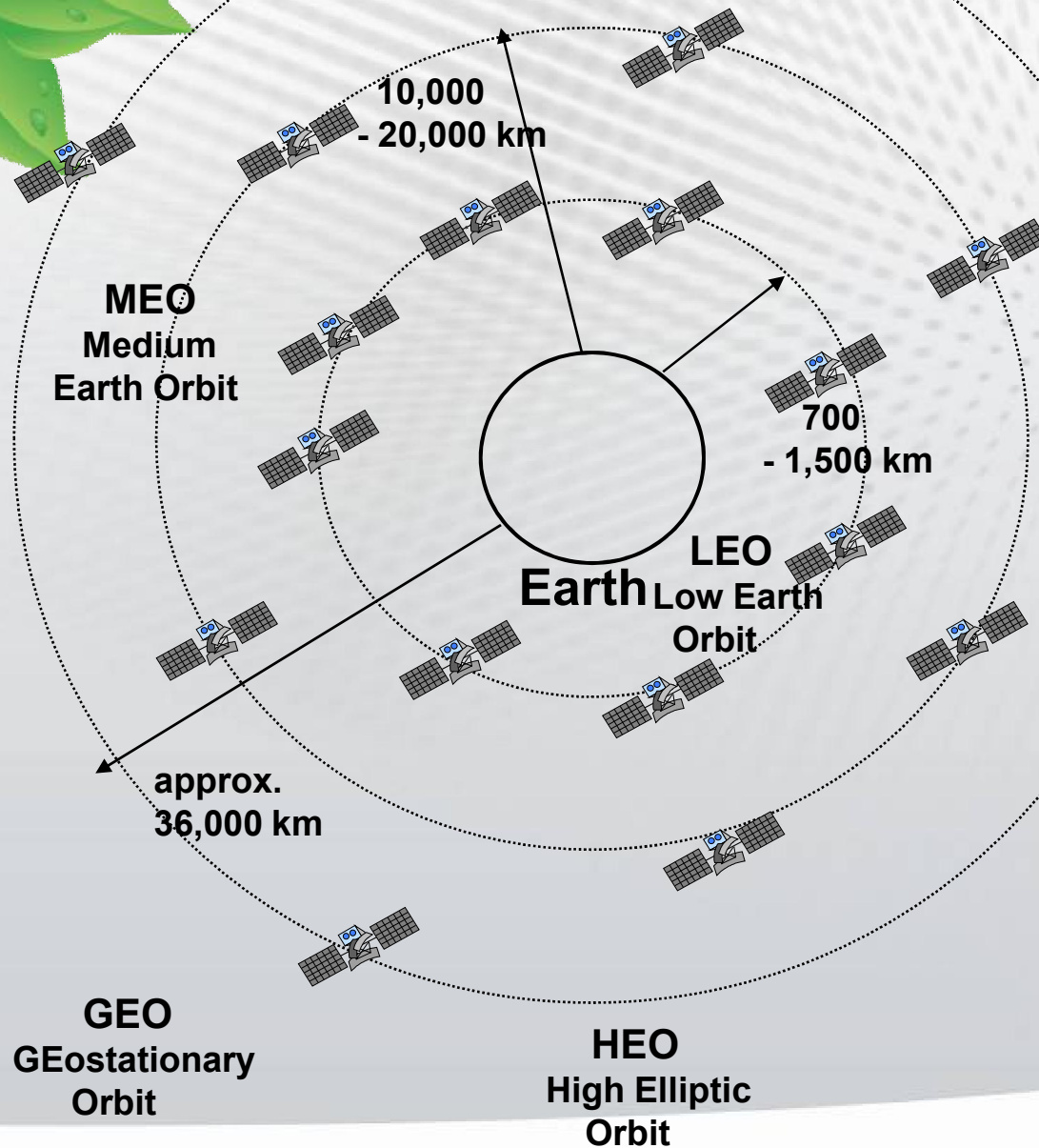
UMTS - CELL LAYER



GLOBAL MOBILE PERSONAL COMMUNICATION SYSTEM (GMPCS)

- Definisi awal : Sistem satelit orbit non geostasioner , disebut juga *Big Leo*
- Frekuensi diatas 1 GHz
- Layanan suara dan data narrow band
- Dianggap sebagai komponen IMT 2000 , yang menyatukan berbagai sistem dalam satu infrastruktur radio terpadu
- Komunikasi *anywhere and anytime*
- Definisi sekarang : Semua sistem yang memberikan layanan telekomunikasi dari gugusan satelit baik trans-nasional, regional, maupun basis global

MOBILE SATELLITE SYSTEMS MSS



Supply to/ in case of:

- inaccessible, underpopulated areas
- poor infrastructure
- high seas
- catastrophe areas
- failure of other supplies

1G:

MARISAT (USA) since 1976

INMARSAT (International Maritime Satellite Organisation):

- since 1979; > 80 member countries
- 4 GEO satellites;
- global access

2G:

- Iridium, ICO, Globalstar
- private MSS operator
- speech- & low data rate services



THANK YOU