INTERNATIONAL TELECOMMUNICATION UNION
Telecommunications Development Bureau (BDT)

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International Mobile Telecommunication-2000 (IMT-2000)

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In this presentation…

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- What is IMT-2000?
- What IMT-2000 offers
- Key features and objectives
- Spectrum for IMT-2000
- Technologies for IMT-2000
- Migration paths
- Future Trends
- ITU Activity, BDT Activity, Coordination among the three Sectors
- ISAP (Istanbul Action Plan) for IMT-2000

Mobile Communication

- **1946- 1960s**   **1980s**   **1990s**   **2000s**

- **Appeared**   **1G**   **2G**   **3G**

- **Analog**   **Digital**   **Digital**

- **Multi Standard**   **Multi Standard**   **Unified Standard**

Terrestrial   **Terrestrial**   **Terr. & Sat**

Mobile Communication

WIRELESS GENERATIONS

- **1 G -analog (cellular revolution)**

     - only mobile voice services

- **2 G - digital   (breaking digital barrier)**
     - mostly for voice services & data delivery possible

- **3 G - voice & data (breaking data barrier)**

     - mainly for data services where voice services will also be possible

- **Beyond   3G   -wide band**

     - higher data rates

Mobile Communication
LIMITATIONS OF 2nd GENERATION SYSTEMS

- **No Global standards**
- **No common frequency band**
- **Low information bit rates**

- **Low voice quality**
- **No support of Video**
- **Various categories of systems to meet specific requirements**

What is IMT-2000?

IMT-2000: International Mobile Telecommunications-2000 for Data & Multimedia Services, set of globally harmonized standards for third generation wireless communications (3G)

They will provide access, any time and anywhere, by means of one or more radio links, to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN/ISDN/IP), and to other services which are specific to mobile users.

A range of mobile terminal types is encompassed, linking to terrestrial and/or satellite based networks, and the terminals may be designed for mobile or fixed use.

Key features of IMT-2000 (1)

High degree of commonality of design worldwide

Compatibility of services within IMT-2000 and with the fixed networks

Provisioning of these services over wide range of user densities and coverage areas (In-building, Urban, Sub-urban, Global)

High quality, high speed access 144 Kb/s, 384 & 2Mbit/s fast wireless access to Internet

Across Networks, across Technologies using a small pocket terminal for worldwide use

Key features of IMT-2000 (2)

worldwide roaming capability

capability for multimedia applications, and a wide range of services and terminals.

efficient use of radio spectrum consistent with providing service at acceptable cost

IMT-2000 shall cover application areas presently provided by separately systems i.e cellular, cordless and paging etc.

A MODULAR STRUCTURE WHICH WILL ALLOW THE SYSTEM TO GROW IN SIZE AND COMPLEXITY

Key features of IMT-2000 (3)

- **SINGLE UNIFIED STANDARD (Data & Multimedia Services)**

 **ACROSS NETWORKS, ACROSS TECHNOLOGIES, SEAMLESS OPERATION USING A SMALL POCKET TERMINAL WORLDWIDE.**

- **HIGH SPEED ACCESS 144KB/S, 384 KB/S & 2MB/S FAST WIRELESS ACCESS TO INTERNET**

- **FULL MOTION VIDEOPHONE**

- **TERRESTRIAL & SATELLITE COMPONETS**

IMT-2000 Will provide

- Simultaneous transfer of speech, data, text, pictures, audio and video

- High-speed, mobile access to Internet

- Entertainment on demand (movies, Music..)

- Video-conferencing

- Mobile-commerce

- Travel information (roads, flights, trains,…)
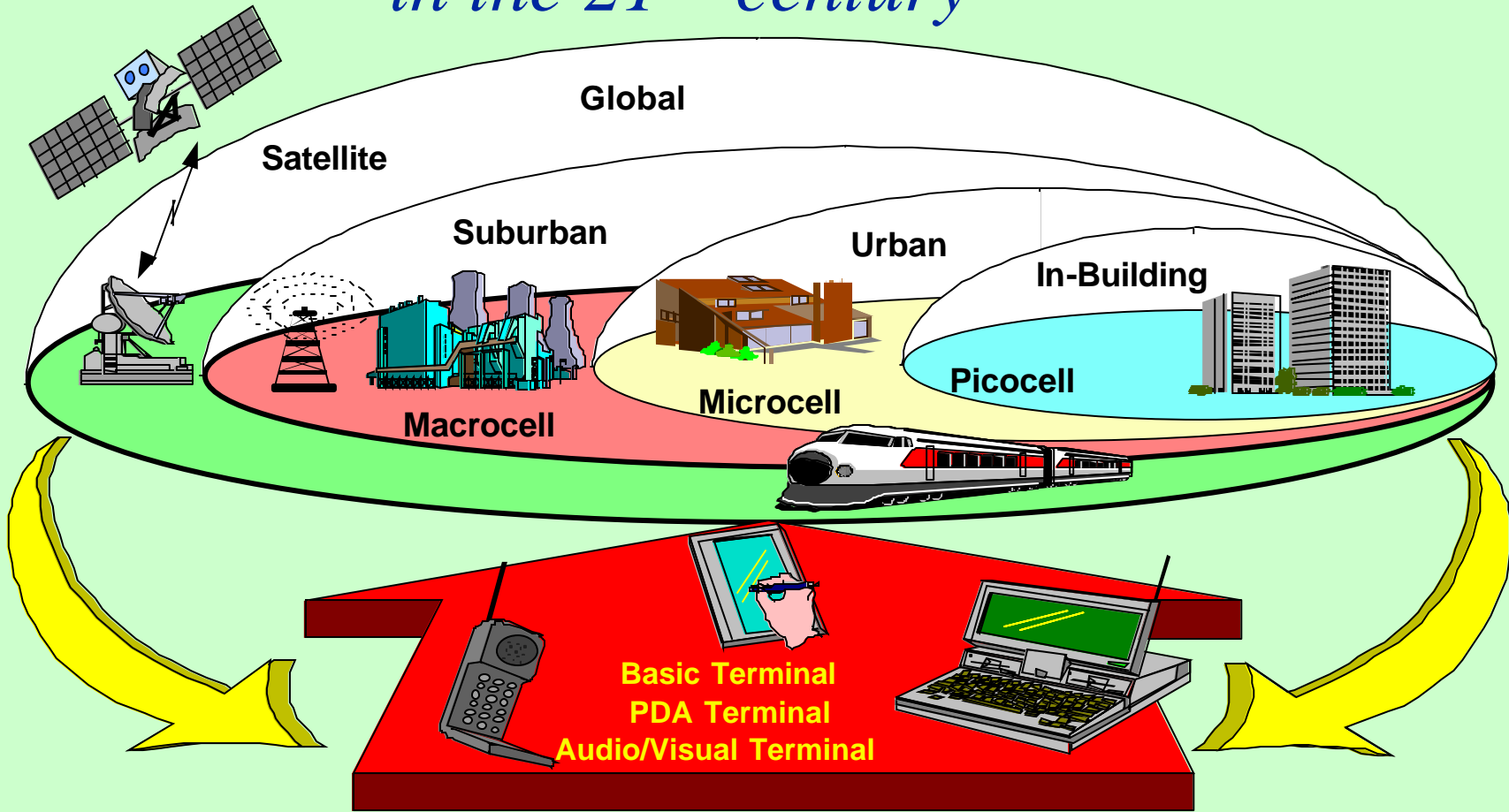
IMT-2000 Spectrum

- **WARC -92** **IDENTIFIED 230 MHz GLOBAL SPECTRUM for IMT-2000:**

    - 1885 - 2025 MHz & 2110 - 2200 MHz for terrestrial
    - 1980 – 2010 MHz & 2170 – 2220 MHz for satellite

- **WARC-2000 IDENTIFIED an additional global band of 230 MHz allowing high speed data**
    - 2500-2690 MHz

- **Bands 806-960 MHZ and 1710-1885 MHz are generally allocated for Mobile Services and the administrations have the right to implement IMT-2000 in any band allocated for the Mobile Services (not just the identified band)**

IMT Technologies

ITU has finally narrowed down technology options
   to the following five:

- IMT -DS   (Direct Spread)   : W-CDMA   UTRA FDD
- IMT -MC (Multi Carrier)   : CDMA 2000
- IMT-TC   (Time Code)   : TD -SCDMA   UTRA TDD
- IMT -SC   (Single Carrier)   : UWC - 136
- IMT-FT   (Frequency Time) : DECT

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- **PAIRED   DS/ MC/SC   ;   UNPAIRED   TDD**
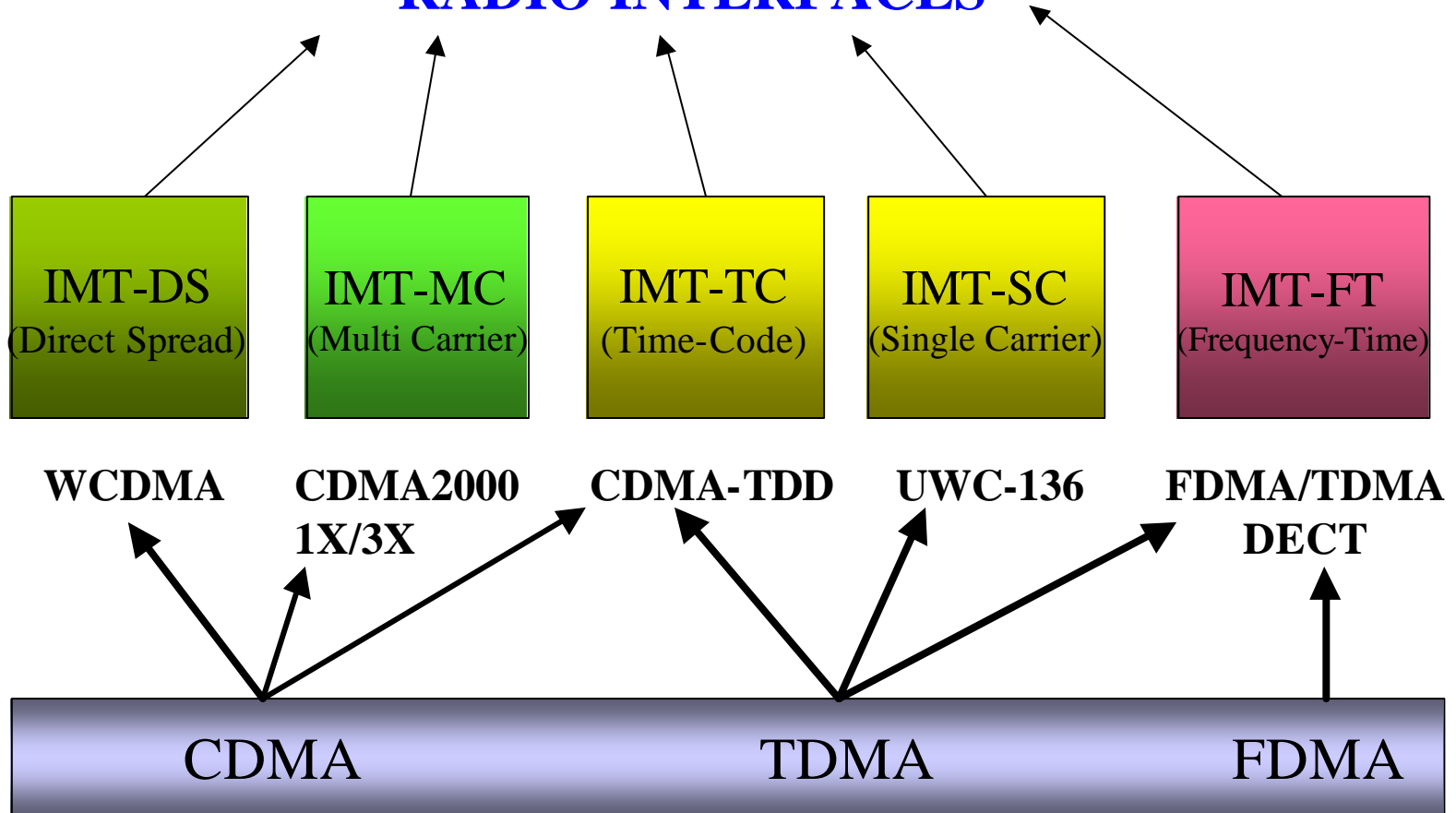
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FURTHER HARMONIZATION   In Process

UTRA : UTMS Terrestrial Radio Access

UMTS :Universal Mobile Telecommunication System

Technologies for IMT-2000

IMT-2000 TERRESTRIAL RADIO INTERFACES

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

WCDMA	CDMA2000 1X/3X	CDMA-TDD	UWC-136	FDMA/TDMA DECT

CDMA   **TDMA**   **FDMA**

IMT-2000 Terrestrial Radio Interfaces (1)

- **W-CDMA**, based on the first operational mode of the UMTS Terrestrial Radio Access (UTRA) Frequency Division Duplex (FDD)

- **CDMA2000,** Multi-carrier FDD, US Telecommunications Industry Association

- **TD-CDMA/TD-SCDMA**, based on the second operational mode of the UTRA Time Division Duplex (TDD) harmonized with China's TD-SCDMA

IMT-2000 Terrestrial Radio Interfaces (2)

- **UWC-136 (EDGE)**, single Carrier, Enhanced Data for Global Evolution

- **DECT** used for cordless phone, considered as part of 3G network

Mobile Communication: IMT-2000 harmonization

- **IMT standards development involves extensive collaboration between many different organizations**
- **Today's operators need seamless 2G ⟶ 3G**
- **Many Focus groups have been established by industry**

  - 2 G operators GSMA, CDG, UWCC, DECT forum

  - 3 G Groups   UMTS Forum, OHG, CDG

  - Focus group for IP-based 3G architecture (3G. IP)

  - SDOs   created 3G PP and 3G PP2 (Partnership Projects)

  SDO: Standards Development Organizations

From 2G to IMT-2000

- Enhanced voice quality, ubiquitous coverage and enable operators to provide service at reasonable cost

- Increased network efficiency and capacity

- New voice and data services and capabilities

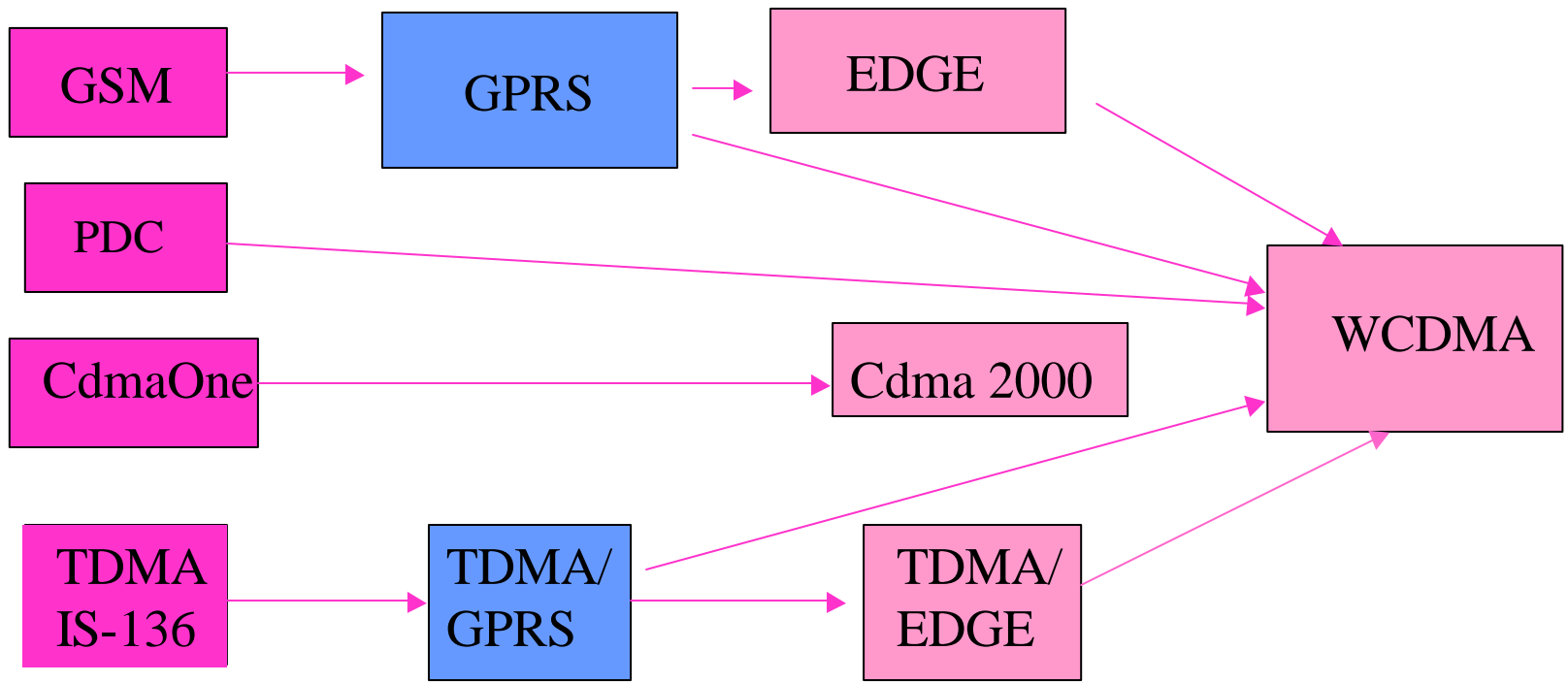- An orderly evolution path from 2G to 3G systems to protect investments.

Migration Path

- While a multiplicity of 2G standards have been developed and deployed, the ITU wanted to avoid a similar situation to develop for 3G.

- Hence, the ITU Radio communication Sector (ITU-R) has elaborated on a framework for a global set of 3G standards, which will facilitate global roaming by operating in a common core spectrum and providing migration path from all the major existing 2G technologies.

- The major 2G Radio access networks are based on either CDMA One or GSM technologies and different migration path is proposed for each of these technologies.
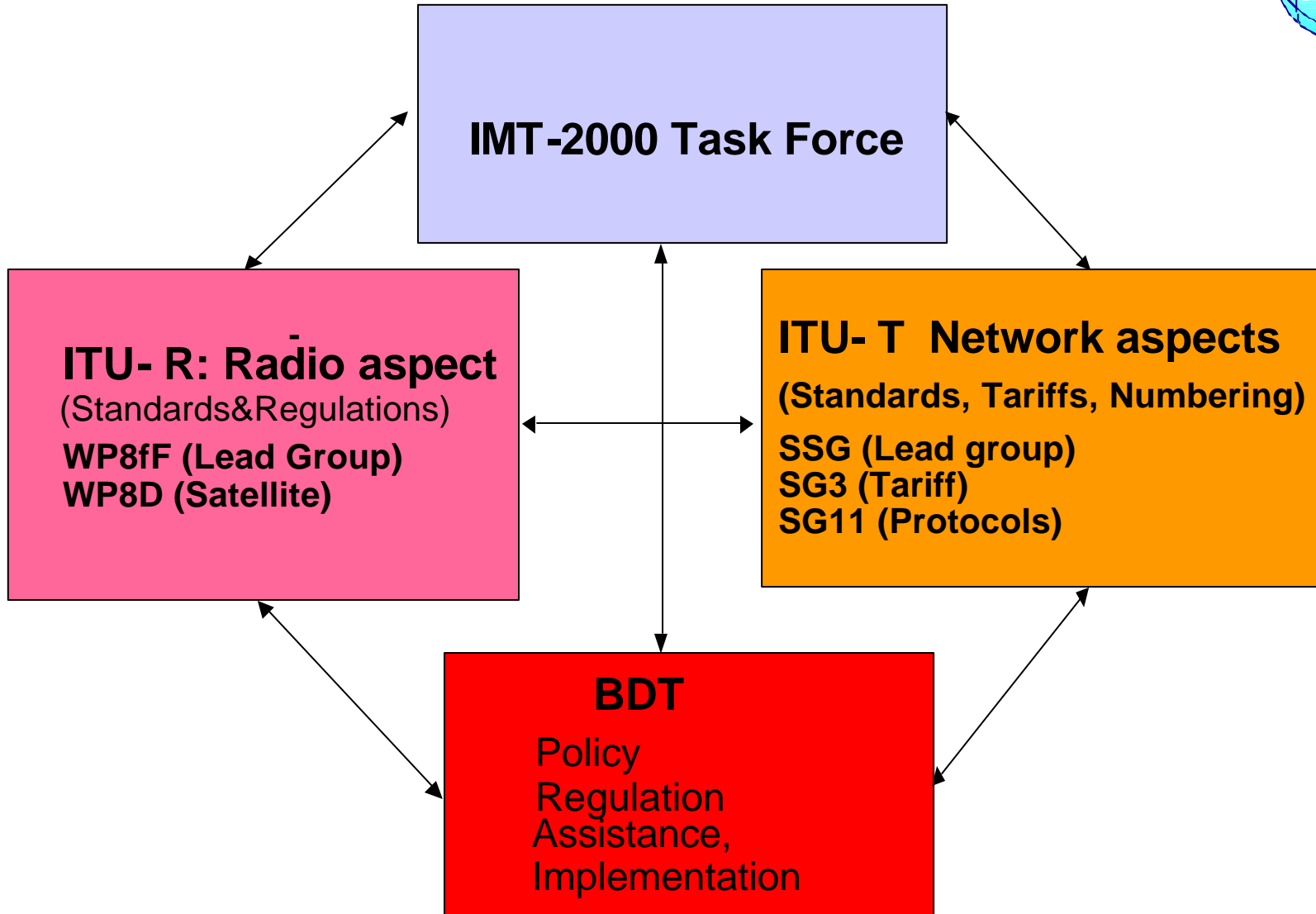
EVOLUTION TO IMT-2000/3G

IMT-2000
CPABLE SYSTEMS

GSM → GPRS → EDGE

PDC

CdmaOne → Cdma 2000

TDMA IS-136 → TDMA/GPRS → TDMA/EDGE

WCDMA

TODAY 2G	2000 EVOLVED 2G	3G
19.2 Kbps	64-115 Kbps	115-384 Kbps 0.384-2 Mbps

ITU and IMT-2000

IMT-2000 Task Force

ITU- R: Radio aspect
(Standards&Regulations)

WP8fF (Lead Group)
WP8D (Satellite)

ITU- T Network aspects

(Standards, Tariffs, Numbering)

SSG (Lead group)
SG3 (Tariff)
SG11 (Protocols)

BDT
Policy
Regulation
Assistance,
Implementation

WTDC-02 (Istanbul):

- RES43: ITU assistance for IMT-2000 implementation
- Question 18/2: migration towards IMT-2000
- Action Plan (Program 2): activities being defined for 2003

Regional Seminars: Abidjan & Moscow

SG2: meeting 2-6.9.02 (Geneva)

- Definition of Workplan
- Definition of Guidelines for a Smooth Migration from 2G to 3G

Finalization of IMT-2000 Handbook

- December 2002 in close collaboration with ITU-T and ITU-R

Results of World Telecommunication Development Conference

Istanbul, 18-27 March 2002

Results of WTDC-02 related to IMT-2000

The recent ITU World Telecommunication Development Conference WTDC-02 (Istanbul, 18-27 March 2002), approved the following texts related to IMT-2000:

- **Resolution 43** (WTDC-02): Assistance for implementing   IMT-2000

-**Question 18/2**: Strategy for migration of mobile networks to IMT-2000 and beyond

 -**Programme 2, point 1.4**: Mobile terrestrial communications

Resolution 43 (WTDC-02): Assistance for implementing IMT-2000

The World Telecommunication Development Conference (Istanbul, 2002),

considering

a) that, at the request of the Member States, the Americas Regional Preparatory Meeting for this conference identified IMT-2000 as a priority to be included in the next action plan of the Telecommunication Development Bureau (BDT);

b) the need to promote IMT-2000 throughout the world, and in particular in developing countries,

Resolution 43 (WTDC-02): Assistance for implementing IMT-2000

- *noting*

the work of the ITU-T Special Study Group on IMT-2000 and Beyond and ITU-R Working Party 8F, and taking into account the need for close coordination with all related initiatives within ITU,

- *resolves*

to include support for implementation of IMT-2000 as a priority in the action plan adopted by this conference,

- *instructs the Director of BDT*

in close collaboration with the Directors of the Radiocommunication Bureau (BR) and the Telecommunication Standardization Bureau (TSB), as well as regional telecommunication organizations:

Resolution 43 (WTDC-02): Assistance for implementing IMT-2000

1 **to encourage and assist countries to implement IMT-2000 systems in the frequency bands identified in the ITU Radio Regulations, using the relevant ITU recommendations, when adopted, for harmonized frequency band implementation;**

2 **to provide direct assistance to countries in using the relevant frequency band plans, when adopted, the radio technologies and the standards recommended by ITU in order to meet their national requirements for the implementation of IMT-2000 in the short, medium and long term;**

3 **to provide information on strategies which can be used for the evolution of first-generation and second-generation mobile systems (cellular/PCS) to IMT-2000;**

Resolution 43 (WTDC-02): Assistance for implementing IMT-2000

4   to develop means to facilitate the implementation of fixed wireless access applications which allow use of IMT-2000 technology and infrastructure;

5   to provide assistance to administrations on the use and interpretation of ITU recommendations relating to IMT-2000;

6   to promote training on strategic planning for the introduction of IMT-2000, taking into account specific national and regional requirements and characteristics,

Resolution 43 (WTDC-02): Assistance for implementing IMT-2000

- *encourages Member States*

**to review, as necessary, their regulatory framework (e.g., licensing, type-approval and customs arrangements) in order
to facilitate global circulation of IMT-2000 terminals, taking into account the relevant ITU Recommendations**

Question 18/2: Strategy for migration of mobile networks to IMT-2000 and beyond

1   Statement of the situation

While it seems clear that the migration to third-generation networks will be universal over time, it will not progress evenly in all countries, in particular developing countries. ITU-D can play an important role in assisting Member States and Sector Members in developing countries with a smooth migration of their existing first - and second-generation networks into third generation and beyond, both technically and economically

Question 18/2: Strategy for migration of mobile networks to IMT-2000 and beyond

2 Question or issue proposed for study

Identify the economic impact and development aspects for such migration, with particular attention to cost affordability for the end-users, as well as identification of migration techniques taking into consideration the experience of developed countries and the special needs of developing countries (e.g. sparse population, low traffic density, propagation conditions, and the need for a low-cost national IMT-2000 network). Examine The possibility of using first and second generation mobile spectrum for IMT-2000 and beyond.

Question 18/2: Strategy for migration of mobile networks to IMT-2000 and beyond

3 Expected output

A guideline for smooth migration, including system interoperability among third-generation technologies, with proper collection, analysis and periodic dissemination of relevant data from relevant groups within ITU and those outside (operator groups for mobile services, etc.).

Question 18/2:   Strategy for migration of mobile networks to IMT-2000 and beyond

4 Timing

The course of the next ITU-D study period with a mid-term guide by early 2004.

5   Proposers/sponsors

This Question has been requested by ITU-D Study Group 2 and developing countries

Question 18/2: Strategy for migration of mobile networks to IMT-2000 and beyond

6 Sources of input

1. Collection of related technical progress in both ITU-R and ITU-T.

2. The ITU handbook on IMT-2000 and beyond.

3. Visions of national and/or regional organizations in developed countries (e.g. ETSI, TIA, ARIB, etc.).

4. Experiences of smooth migration by administrations of developed and developing countries.

7 Target audience

	Developed countries	Developing countries	LDCs
Telecom policy-makers	X	X	X
Telecom regulators	X	X	X
Service providers/operators)	-	X	X
Manufacturers	X	-	-

a) Target audience - Who specifically will use the output

Telecommunication operators, policy makers and regulators

b) Proposed methods for the implementation of the results

Operators will directly implement the results of this work

Question 18/2: Strategy for migration of mobile networks to IMT-2000 and beyond

8   Proposed methods of handling the question or issue

a)   How?

Within a study group:

A core group of voluntary and BDT experts should be established and tasked with the timely proposed outputs for consideration by the study group in its yearly meeting. The core group should be composed of mobile services experts, preferably from mobile operators and manufacturers, with geographical balance between developed and developing countries.

b)   Why?

The Question output needs a multi-year period to achieve its objectives, being mainly based on future work progress achieved by ITU-R and ITU-T and those national and/or regional organizations concerned in developed countries.

9   Coordination

The proposed expert core group should take into consideration (and without duplication of activities):

• output from the study groups in ITU-T and Working Party 8/F of ITU-R;

•any regional study for such migration, especially by regional operator groups (e.g. ETNO, mobile operator groups, etc.);

•output from those involved in dual-mode operations for the mobile services (terrestrial and satellite modes).

10   Other relevant information

Data related to IMT-2000 licensing regimes

Programme 2, point 1.4: Mobile terrestrial communications

In addition to Resolution 43 and Question 18/2, the Istanbul Action Plan for the ITU Telecommunication Development Sector adopted by WTDC-02, in its Program 2 (Technologies and Telecommunication Network Development) point 1.4 dealing with "Mobile terrestrial communications, states that:

"1.4 Mobile terrestrial communications

Mobile communications tended to be developed and implemented at the national or regional level, with little thought for global interconnection. The result is a wide range of technical standards which use many parts of the radio-frequency spectrum - analogue and digital cellular phones, pagers, cordless telephones, mobile data systems, wireless local area networks and the new breed of satellite-based mobile telephones, to name just a few. Incumbent mobile operators do not want to have to discard their entire existing infrastructure; rather, they prefer a new system, which can coexist and interoperate with the present one and act as an adjunct to it. Therefore, because of both the explosive growth of second-generation mobile systems, network development and migration to third-generation networks (IMT-2000) and beyond, high priority will be accorded to mobile communications within this programme. Information will be also provided on mobile systems operating below 600 MHz, which are of particular interest to some developing countries."

ITU-D studies on the evolution and migration towards IMT-2000 (Question 18/2)

BDT Activities on IMT-2000

- **A detailed Work Plan on the implementation of Resolution 43 is going to be finalised inside BDT for year 2003.**

- **The Objectives for 2003 –2006 are going to be finalized as well.**

Implementation of WTDC-02 Resolution 43

Seminars, Workshops, Production of Handbooks and Guidelines, Cooperation with Regional Organizations, ITU-D SG's Activities, Direct Assistance via BDT Unit/Field Offices, will be part of the BDT Work Plan to implement Resolution 43

Implementation of WTDC-02 Resolution 43

- Resolution 43 is supposed to be implemented within the Programs and Direct Assistance as approved during last WTDC-02.

Results of the studies on Question 18/2

- **The first Rapporteur's Group Meeting on Q.18/2, was held in Geneva, 24-25 June 2002.**
- **Second Meeting during ITU-D SG2, 2-6 September 2002**

Results of activities on Question 18/2

Progress of the work

– **Important issues: the economic impact of third generation mobile networks (3G), cost affordability of customer equipment, experience of developed countries, special needs of developing countries (case studies for example), cost of migration to third generation, capabilities of fixed networks to take 3G roamers.**

– **Draft guidelines for a smooth migration for mobile networks to IMT-2000 and beyond should be prepared by mid-2004.**

Results of the studies on Question 18/2

Progress of the work

-There might be no unique solution for migration for developing countries. Migration might be different than for developed countries due to, among other reasons, the penetration levels of mobile networks. The results of the work of the ITU-T and ITU-R Sectors as well as different technologies are under considerations

- Cost affordability for end users will be a key focus of Question 18/2 work. The study should take into account also the needs of developing countries.

Results of studies on Question 18/2

Progress of the work

-**Licensing for third generation (working under the ITU Secretary General's new initiatives programme) documents are available on the web at the following web address (<http://www.itu.int/osg/spu/ni/3G/workshop/index.html>).**

The final report from the last ITU-Workshop (2001) is the core of the relevant brochure. An official database on licensing for IMT-2000 is under development in ITU.

Results of the studies on Question 18/2

Progress of the work

- Initial Promotion of the work is done by the BDT Administrative Circular CA/10, 5 July 2002

- A living document prepared by the BDT Secretariat in consultation with the ITU-T and ITU-R Sectors and contains a listing of documents/recommendations/deliverables and texts related to IMT-2000 is maintained being updated and supplemented whenever is necessary

Results of the studies on Question 18/2

Summary of the aspects that have to be investigated during the progress of the work of Q.18/2:

- **Identification of special needs of developing   countries regarding migration**
- **Identification of Migration techniques**
- **Cost of network migration for the operator**
  - **using of existing infrastructures**
- **Cost affordability for end users**
- **Experience of developed countries when   choosing current or future migration paths**

Results of the studies on Question 18/2

- **Possibilities of using first and second generation mobile spectrum for IMT-2000 and beyond**

- **Interoperability among first and second generation mobile system and IMT-2000 systems and beyond**

- **Interoperability among IMT-2000 technologies**

- **Extension of IMT-2000 services regardless of   the access system**

- **Lawful interception and common access to emergency services.**

Progress of Q.18/2 Studies: ITU-D SG2 meeting, Geneva 2-6 September 2002

Special needs for developing Countries:

- **Available market for the new mobile services ?**

- **Level of Rural coverage (FAO opinion)**

- **Areas primarily coverage-limited (rural, sparsely populated and/or very low traffic density) Spectrum below 1 GHz allowing big coverage per single cell may be interesting for developing countries (2.1 GHz requires five times more cell sites than 800 MHz and more than thirteen times more cell sites than 450 MHz). Traffic capacity per cell is constant, larger the cell lower per user traffic**

Special needs for developing countries

Areas primarily capacity-limited (dense urban areas): cities growing so quickly that fixed lines should be installed fast to meet the demand.

Wireless systems such as IMT-2000 may be cost effective and flexible for operators that want to expand their network as demand for voice/data services increases: less expensive, faster deployment, handling of both fixed and mobile traffic, voice and data services providing high speed connectivity to be used by clinics, schools, libraries, governments, telecenters and others

Progress of Q.18/2 Studies: ITU-D SG2 meeting, Geneva 2-6 September 2002

Special needs for developing countries

Cost affordability for end user:Cost of handsets is a critical factor

Service cost affordability: critical regulatory issue (interconnection rates, tariffs, etc)

Progress of Q.18/2 Studies: ITU-D SG2 meeting, Geneva 2-6 September 2002

Special needs for developing countries

Dispersed population: Sharing Network resources, speedy deployment of new technologies,lower costs to the Operators, lower costs to the subscribers (Regulatory aspects)

MVNO's: Scarcity of spectrum, Sharing Network resources, speedy deployment of new technologies, lower costs to the Operators, lower costs to the subscribers (Regulatory aspects)

Migration techniques of existing Systems to IMT-2000

From Analog Systems (AMPS and NMT-450)

From cdmaOne (CDMA IS-95A/B) Systems

From TDMA Systems

From GSM/GPRS Systems

Progress of Q.18/2 Studies: ITU-D SG2 meeting, Geneva 2-6 September 2002

Opinions expressed by developing countries:

Timing (when) and specific method (how) of migration for their operators is considered crucial

IMT-2000 technologies can help to meet their special needs by bringing internet and other advanced solutions to developing countries particularly in an era of convergence

Availability of an information bank consisting of experience of countries having finalized the authorization process of IMT-2000