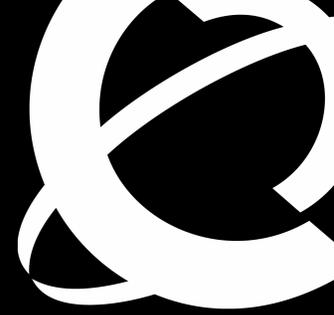




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Business made simple



# Mobile Broadband Wireless Access Standards and Spectrum

José Costa

Senior Manager, Wireless Access Standards

NORTEL

Tokyo, Japan, 1 June 2007

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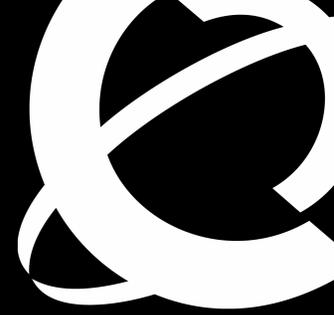
© 2007 Nortel Networks Corporation

# Abstract



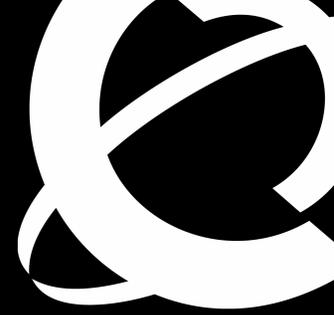
- This presentation provides an overview of broadband wireless systems standardization in ITU-R and IEEE and the spectrum needs. The preparations for WRC-07 Agenda Item 1.4 (spectrum for International Mobile Telecommunications - IMT) and Agenda Item 1.9 (satellite/terrestrial sharing in 2500-2690 MHz); including some of the key issues and the status of CITELE positions, are summarized. The results of the ITU-R Working Party 8F meeting in Kyoto are also summarized.

[http://www.ituaj.jp/08\\_tm/kouen/kouen\\_2007\\_06.html#itur](http://www.ituaj.jp/08_tm/kouen/kouen_2007_06.html#itur)



# Outline

- **Broadband Wireless Access**
- **Standardization**
  - ITU-R
  - IEEE
- **Spectrum**
  - Preparations for WRC-07
  - Agenda Item 1.4 (spectrum for IMT)
  - Agenda Item 1.9 (satellite/terrestrial sharing in 2500-2690 MHz)
  - CITELE Activities
- **Results of ITU-R WP 8F (Kyoto, 23-31 May 2007)**
- **Preparations for ITU-R WP 8A (Geneva, 12-20 June 2007)**



# Broadband Wireless Access (BWA)

- wireless access in which the connection(s) capabilities are higher than the primary rate (i.e.,  $>1\ 544$  kbit/s).

- Three aspects:

**fixed** application in which the location of the end-user termination and the network access point are fixed.

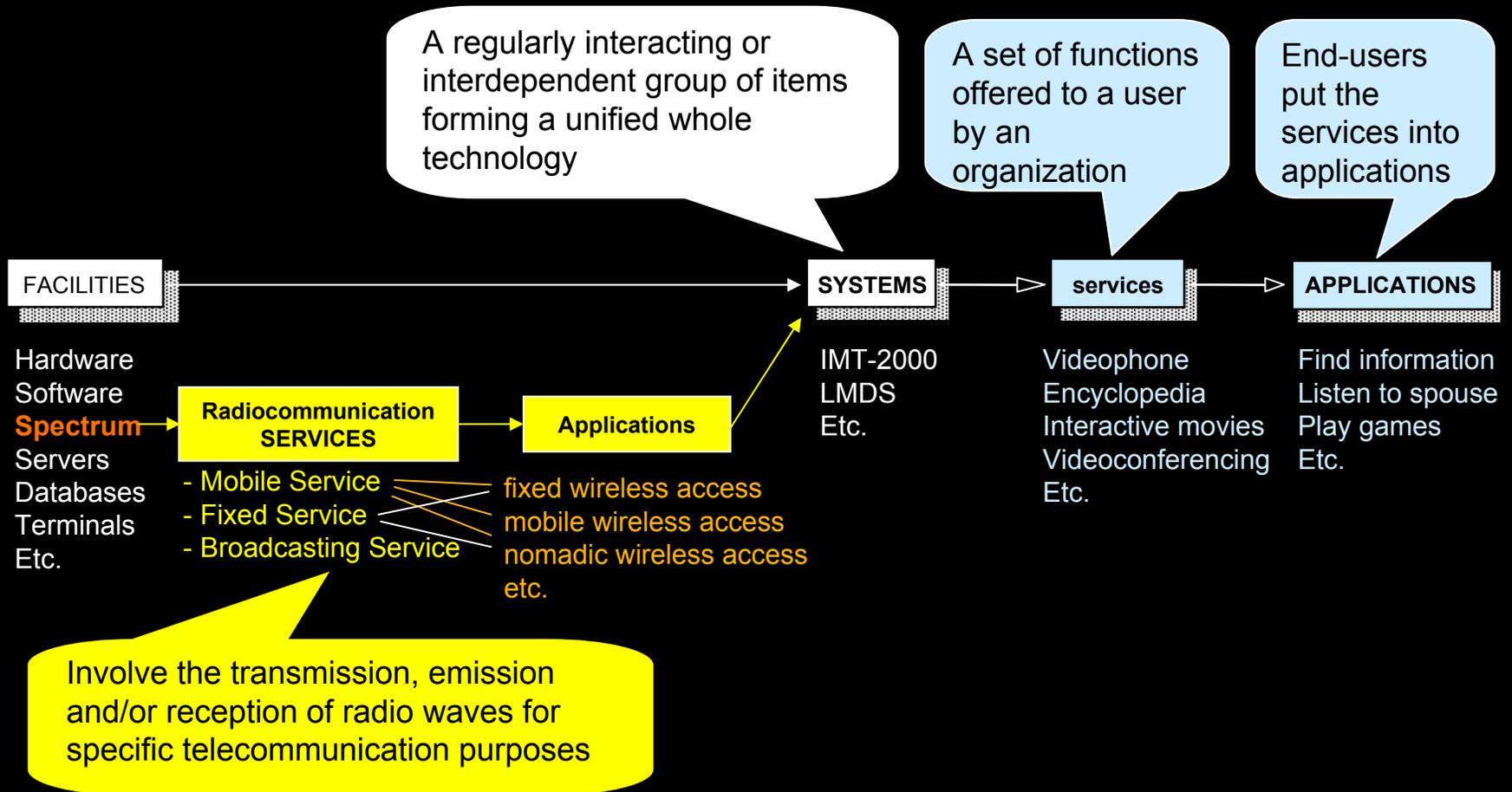
**mobile** application in which the location of the end-user termination is mobile.

**nomadic** application in which the location of the end-user termination may be in different places but it must be stationary while in use.

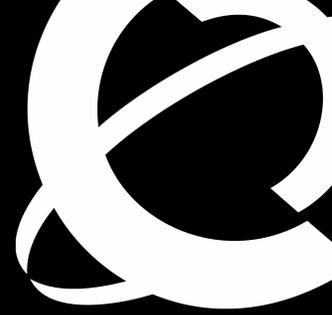
Reference: [Recommendation ITU-R F.1399](#), “Vocabulary of terms for wireless access”

# The need for spectrum:

## Radiocommunication Services enable wireless communication services

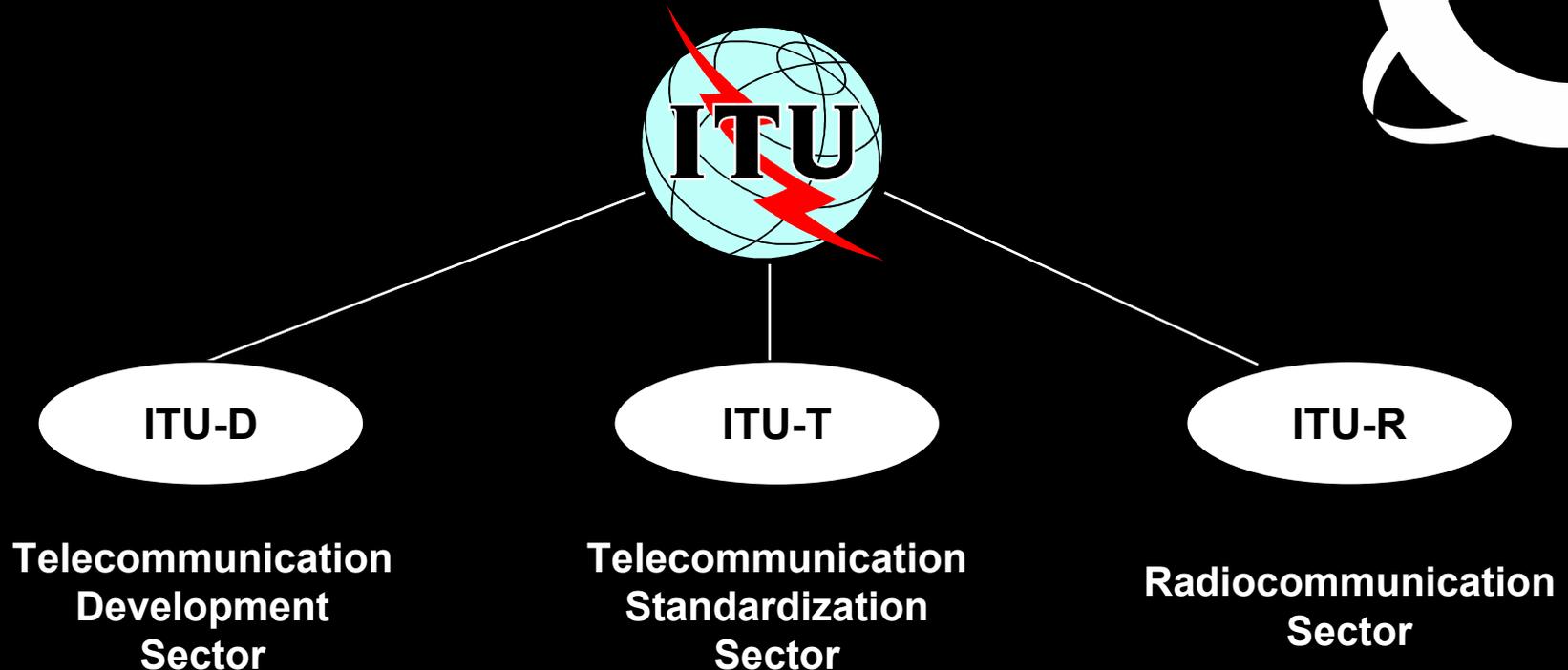


# Outline



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# International Telecommunication Union



## *BWA Activities:*

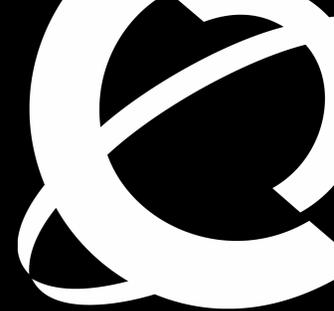
- Assisting developing countries
- Next Generation Networks
- Mobile telecomm networks
- Broadband cable networks
- Wireless MANs (WMANs)
- Radio LANs (RLANs)
- IMT-2000 and beyond

Study Group [2](#)

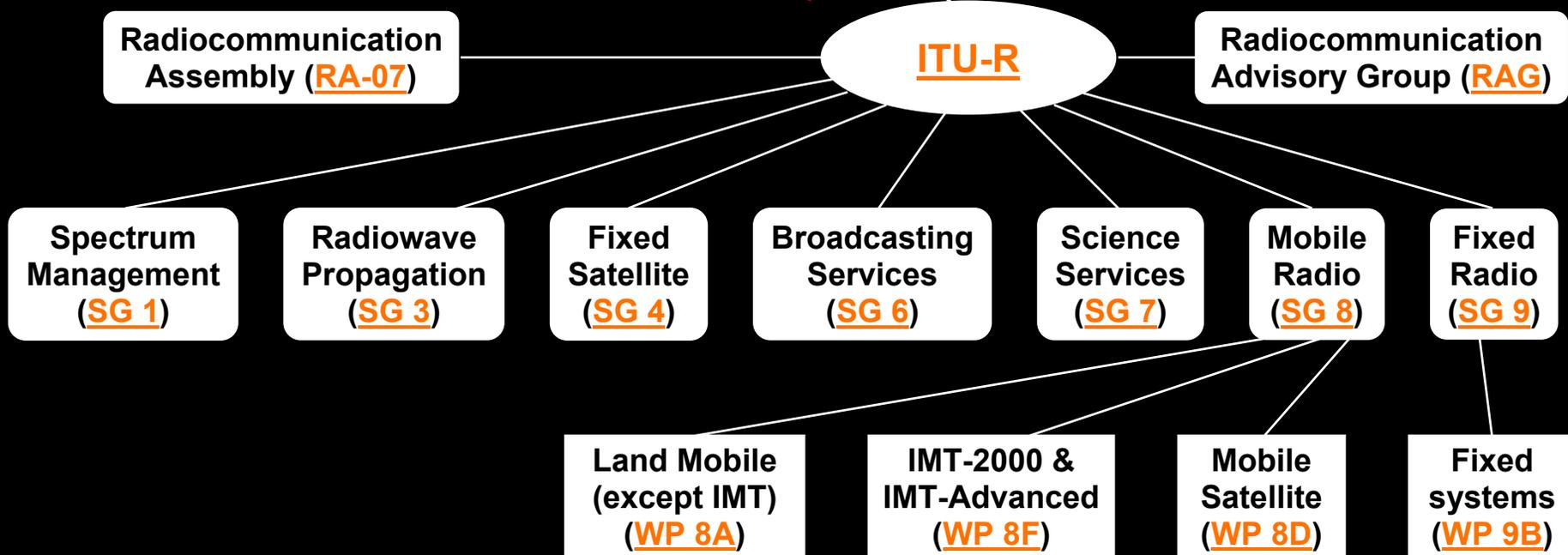
Study Groups [9](#), [13](#) and [19](#)

Study Groups [8](#) and [9](#)

# ITU-R Organization (partial view)



Radiocommunication  
Sector



RA-07	Radiocommunication Assembly 2007
WRC-07	World Radiocommunication Conference in 2007
SG	Study Group
WP	Working Party

## Wireless Access Systems (WAS)

Wireless Access Systems (WAS) are defined as end-user radio connections to public or private core networks. Technologies in use today for implementing wireless access include cellular, cordless telecommunication, and wireless local area network systems.

Advances in technology and competitive access are driving the revolution towards wireless access infrastructure. Traditionally, the most difficult component of the network to build and the least cost-effective to maintain has proven to be the local access network regardless of a developing or a developed economy. As a result, fixed wireless access to the core network has proven to be an effective alternative in the provision of basic telephone service.

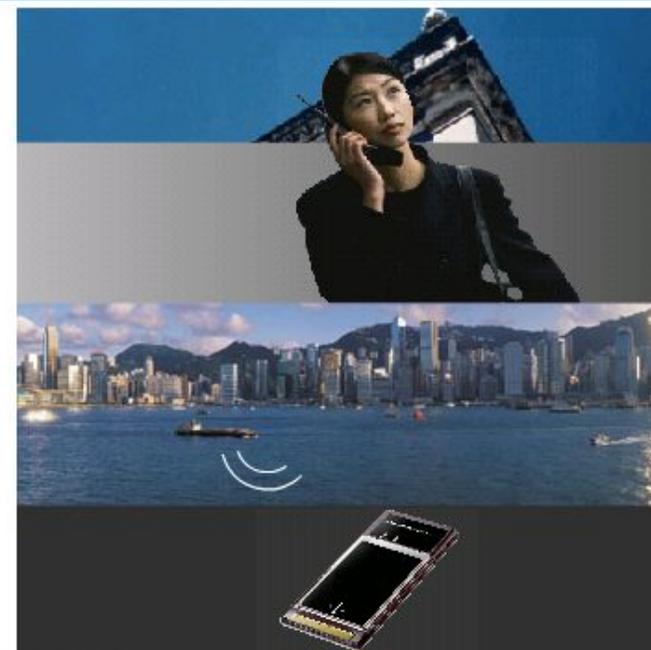
Public and private WLAN (or RLAN) systems are quickly emerging as a preferred access technology. In conjunction with the deployment of IMT-2000, WLAN gives operators an opportunity to expand both overall market size and competitive position for data services.

The [ITU Radiocommunication Sector](#) is actively participating in the development of WAS and its main activities comprise international standardization, including frequency spectrum and technical specifications.

### ▶ [ITU and WAS](#)

### ▶ [ITU and Broadband](#)

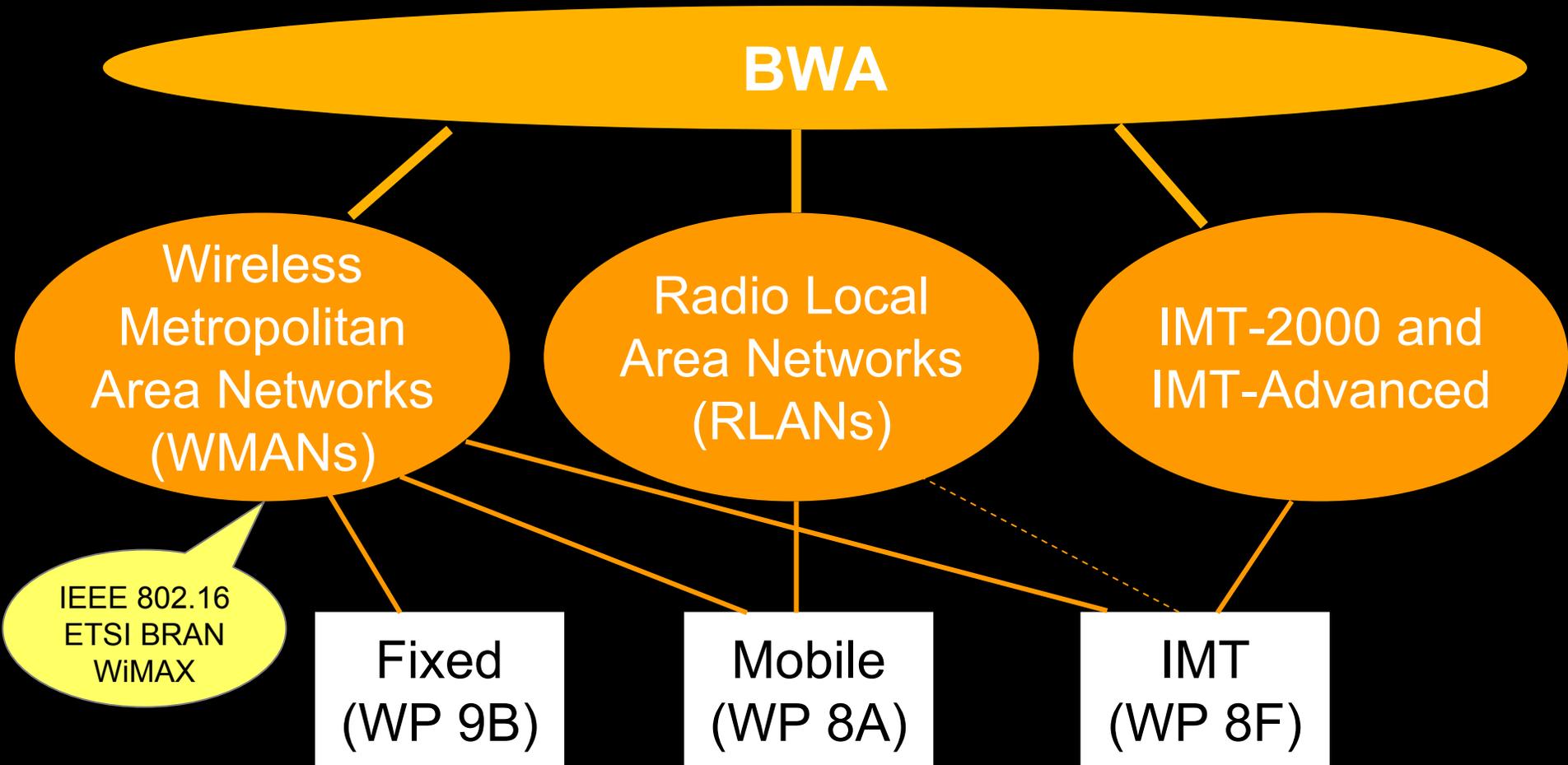
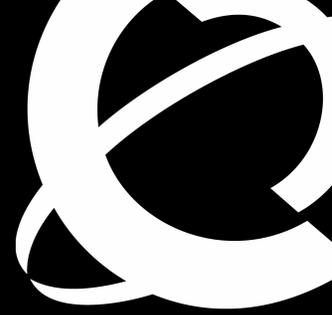
- ▶ [Promoting Broadband](#)
- ▶ [Regulatory implications of Broadband](#)
- ▶ [Broadband access technologies](#)
- ▶ [ITU All Star network Access Workshop \(Geneva, 2-4 June 2004\)](#)



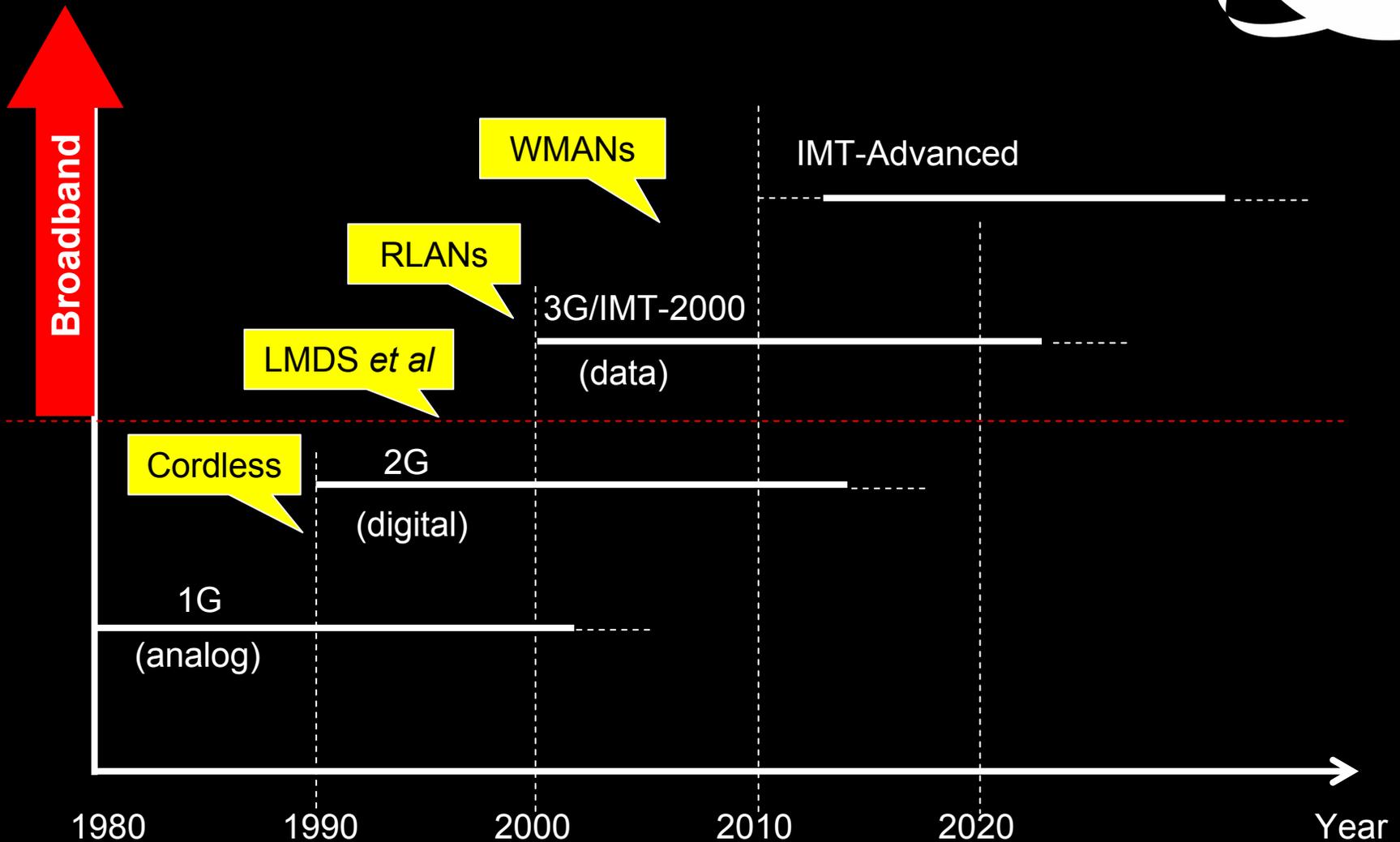
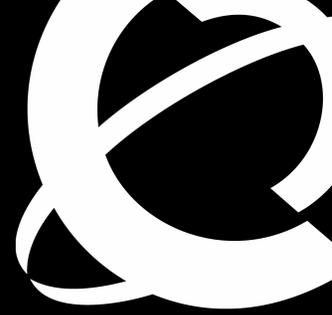
### About WAS

- ▶ [Handbook](#)
- ▶ [Useful links](#)
- ▶ [IMT-2000](#)
- ▶ [Global Standards Collaboration](#)
- ▶ [Contact WAS](#)

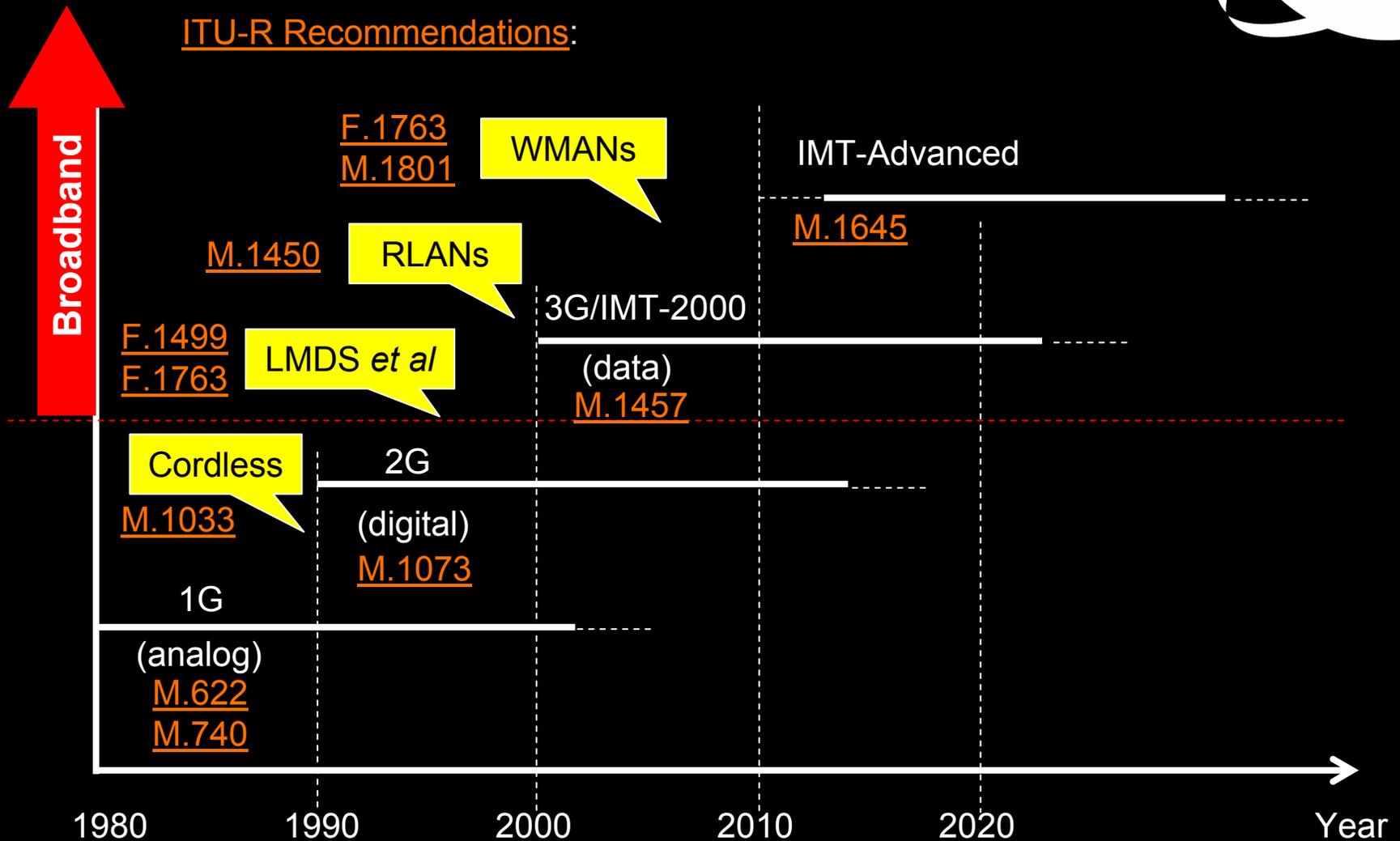
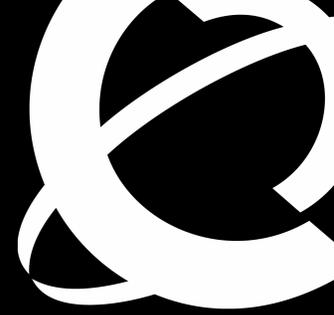
# Broadband Wireless Access (BWA) Systems and Standards in ITU-R



# Generations of mobile wireless systems and other radio systems

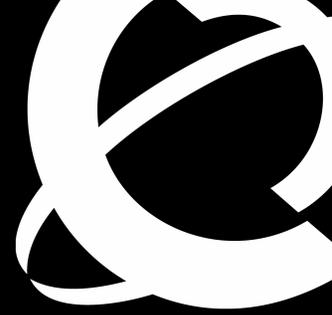


# Generations of mobile wireless systems and other radio systems



# ITU-R WP 8F (IMT-2000): the terrestrial radio interfaces

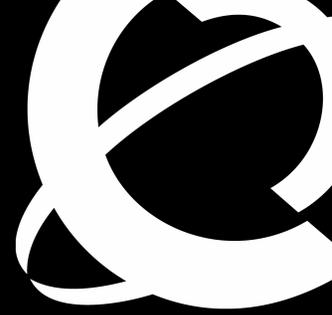
([Recommendation ITU-R M.1457](#))



<b>Full Name</b>	<b>Common Names</b>
IMT-2000 CDMA direct spread	UTRA FDD WCDMA UMTS
IMT-2000 CDMA multi-carrier	CDMA2000 1x and 3x CDMA2000 1xEV-DO CDMA2000 1xEV-DV
IMT-2000 CDMA TDD (time-code)	UTRA TDD 3.84 Mchip/s high chip rate UTRA TDD 1.28 Mchip/s low chip rate (TD-SCDMA) UMTS
IMT-2000 TDMA single-carrier	UWC-136 EDGE
IMT-2000 FDMA/TDMA (frequency-time)	DECT

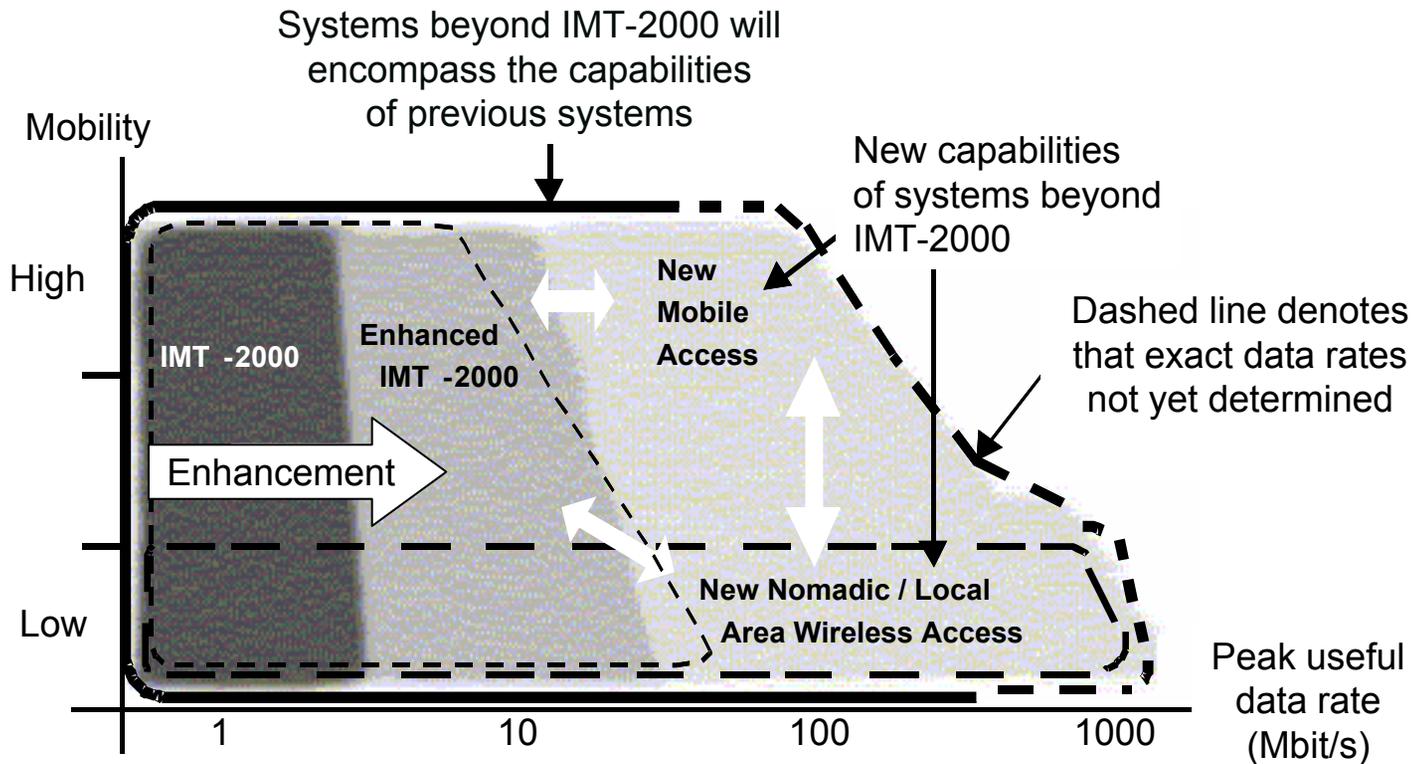
A draft revision includes a sixth terrestrial radio interface: OFDMA TDD WMAN, based on the IP-OFDMA proposal: <http://www.itu.int/ITU-R/go/ip-ofdma>

# Evolving Capabilities of IMT-2000 and Systems Beyond



- Goal: anytime, anywhere, anyone – the deployment of IMT-2000 systems started in the year 2000.
- IMT-2000 original minimum requirements for radio technology evaluation:
  - 144 kbit/s (for vehicular high speed),
  - 384 kbit/s (for medium speed), and
  - 2048 kbit/s (for indoor, low speed)
- Currently the IMT-2000 standard supports up to about 14 Mbit/s and further enhancements are being developed.
- The IMT-2000 radio interfaces are expected to evolve and converge towards IMT-Advanced.
- Research targets for IMT-Advanced include: 100 Mbit/s for high mobility and 1 Gbit/s for low mobility, for deployment after 2010.

# Framework for Development of IMT-2000 and systems beyond (IMT-Advanced)



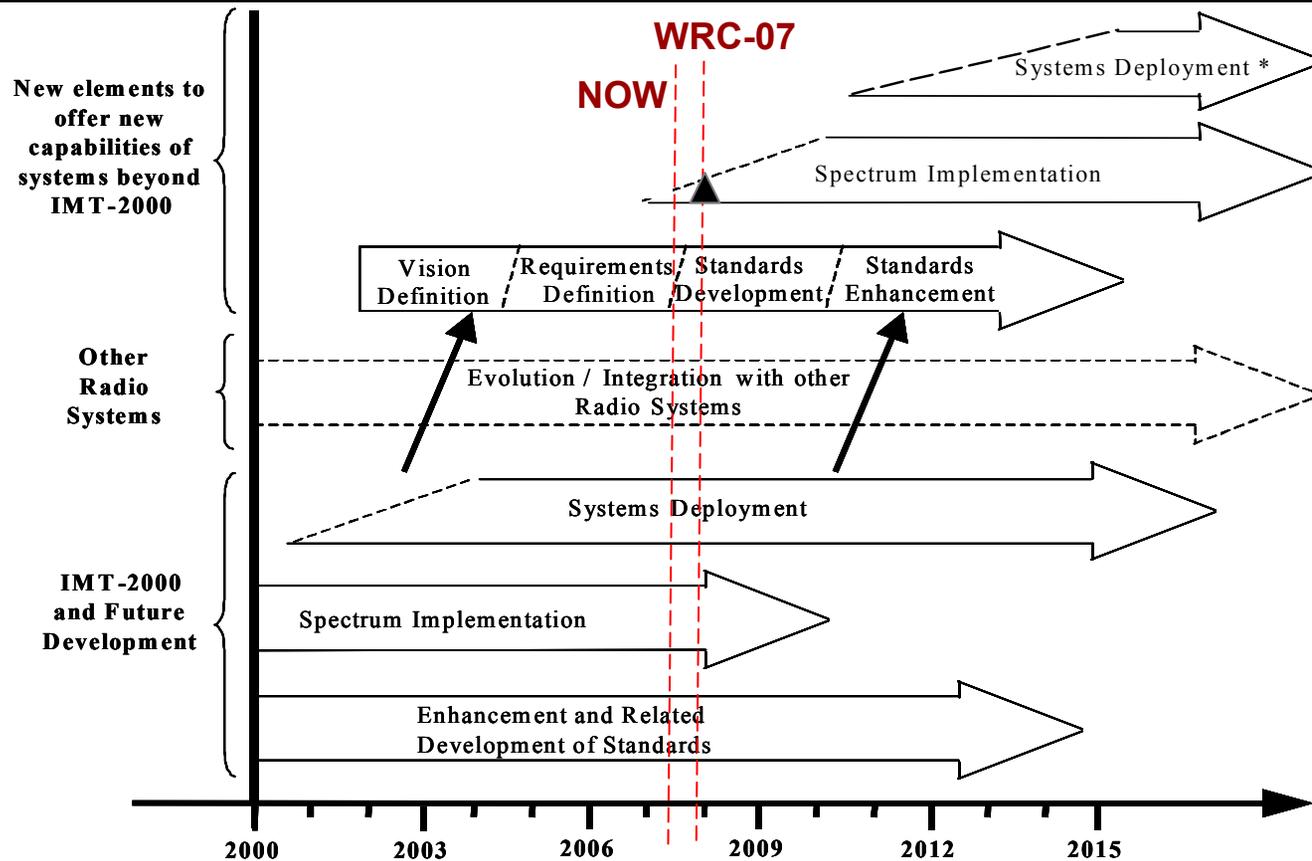
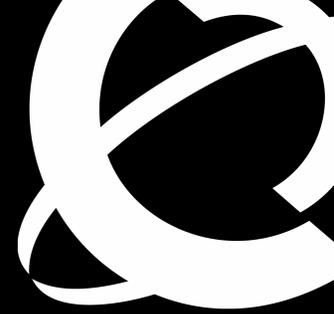
KEY:  Denotes interconnection between systems via networks, which allows flexible use in any environment without making users aware of constituent systems

 Nomadic / Local area access systems

 Digital broadcast systems

Reference: [Recommendation ITU-R M.1645](#)

# IMT deployment & development timelines

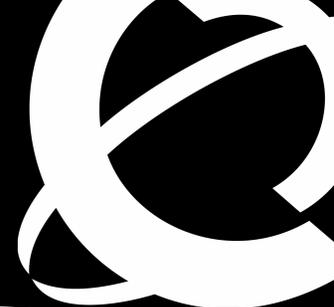


The sloped dotted lines indicate that the exact starting point of the particular subject can not yet be fixed.

▲ : Expected spectrum identification at WRC07

\* : possible wide deployment around the year 2015 in some countries

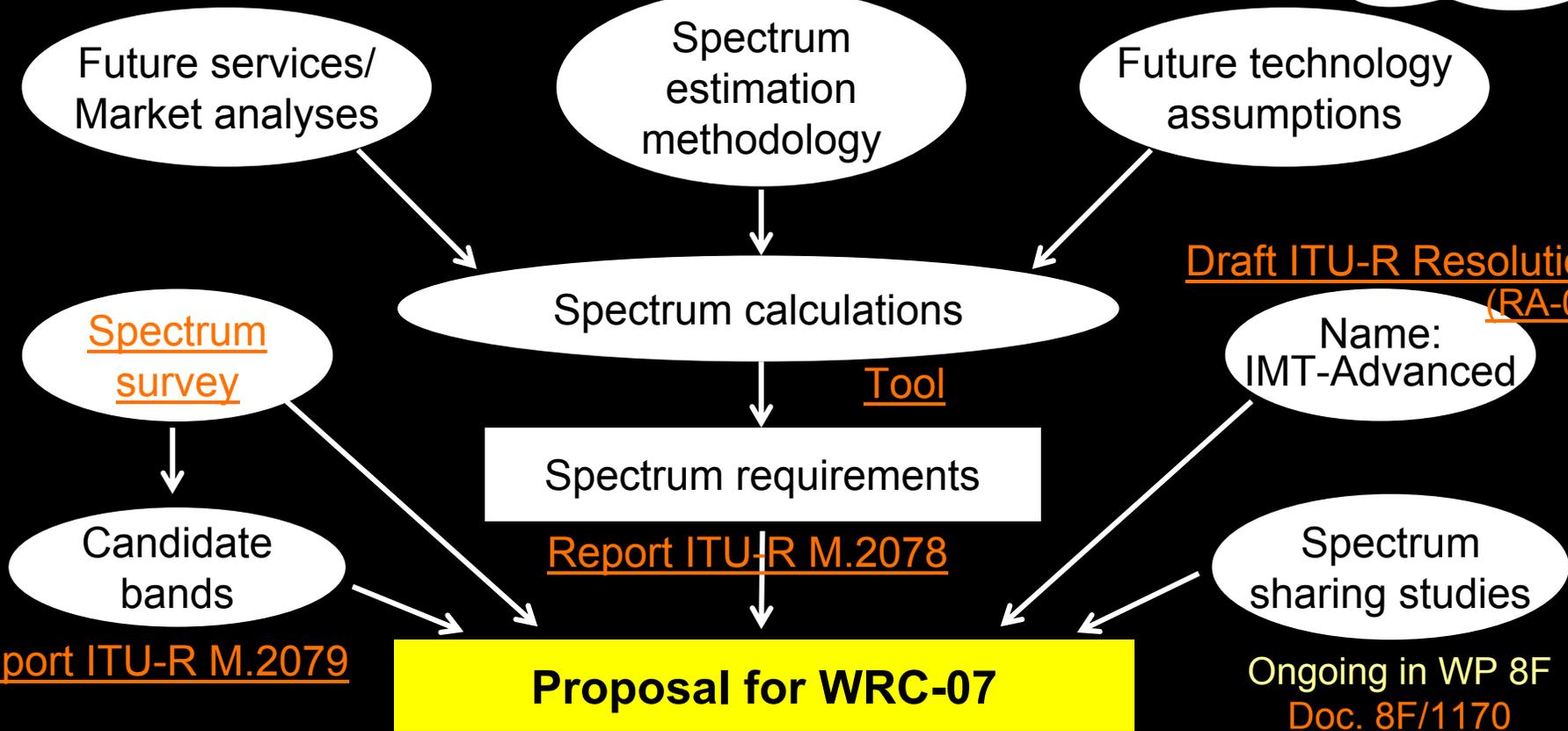
# Results to-date in ITU-R



Report ITU-R M.2072

Rec. ITU-R M.1768

Report ITU-R M.2074



2007-2010: Development of standards for IMT-Advanced

Draft Resolution ITU-R [M.PRINCIPLES] (RA-07)

# RA-07: Draft New Resolution ITU-R

## Principles for the process for IMT-Advanced

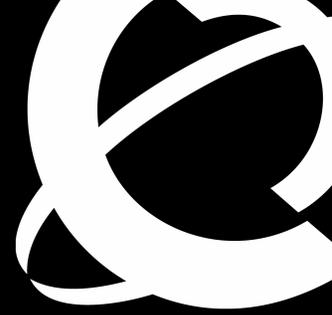


shall include ...

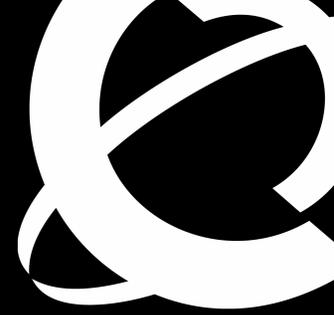
- the **definition** of **minimum technical requirements** and **evaluation criteria**...
- **an invitation** ... for candidate radio interface **technologies for IMT-Advanced** ...
- **an evaluation** by ITU-R of the radio interface technologies proposed for IMT-Advanced to ensure that they meet the requirements and criteria ...
- **consensus building** with the objective of achieving **harmonization** ... wide industry support ...
- a **standardization** phase where the ITU-R develops the IMT-Advanced radio interface specification Recommendation(s) based on ... an evaluation ...
- reviews of the minimum technical requirements and evaluation criteria ... designated as **separately identifiable versions for IMT-Advanced** ... include review of existing versions to determine whether they should remain in force ...
- an **ongoing and timely process** where new radio interface technology proposals may be submitted and existing radio interface specifications can be updated ...

Reference: [Annex 2](#) to [RA-07 Document 8/1004](#): <http://www.itu.int/md/R03-SG08-RP-1004/en>

# IEEE



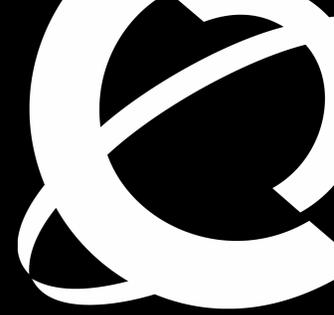
- Institute of Electrical and Electronics Engineers, Inc.
  - “The IEEE, a non-profit organization, is the world's leading professional association for the advancement of technology.”
- Global scope and membership
  - 370,000 members, in more than 160 countries
- Sector Member of ITU-R
  - Regional / International Organization
- IEEE-SA: IEEE Standards Association
  - over 900 active IEEE standards; more than 400 in development



# IEEE 802

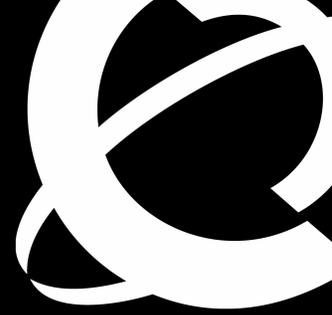
- LAN/MAN Standards Committee
  - local/metropolitan area networks
- Multiple working groups
  - wired and wireless
- Global scope and membership
- Meets three times per year
  - ~1500 people per meeting
- Most groups meet six times per year
- Membership
  - people (not companies or institutions)
  - No membership fee
  - Membership gained by participation

# IEEE 802 Process (typical)



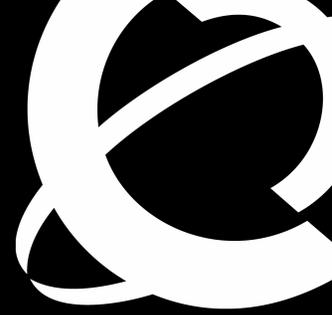
- Project Authorization (“PAR”) for work item
- Call for Contributions
  - Specific topics for discussion at next meeting
- Receive and post written contributions
- Discuss and debate at meeting
- Create draft by 75% vote
- Two-round ballot
  - Working Group Ballot
    - Working Group members
  - IEEE "Sponsor Ballot"
    - open to all
    - requires “balance” (producers and users)
  - Comments require written response

# IEEE 802 Standards in ITU

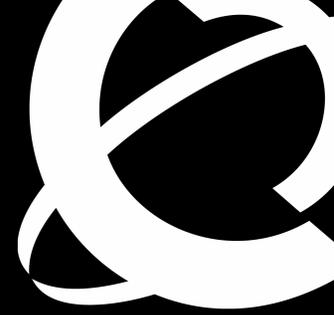


- ITU-R Rec. F.1763 (April 2006)
  - BWA in the fixed service
  - Recommends IEEE Std 802.16 and the equivalent ETSI BRAN HIPERMAN
- ITU-R Rec. M.1801 (March 2007)
  - BWA in the mobile service
  - Recommends IEEE Std 802.16, & others
- ITU-R Rec. M.1457
  - IEEE proposed in Nov 2006 to add 802.16-based “IP-OFMDA” as the 6<sup>th</sup> terrestrial radio interface of IMT-2000.
  - Draft revision includes it as “OFDMA TDD WMAN” (31 May 07)

# New IEEE 802 Projects toward IMT-Advanced



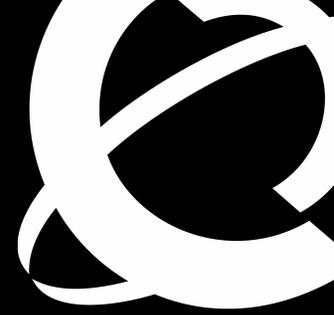
- IEEE Project P802.16m
  - developing Advanced Air Interface
  - to meet “the cellular layer requirements of IMT-Advanced”
  - initiated December 2006
- 802.11 Very High Throughput Study Group
  - first meeting: May 2007
  - possible direction toward IMT-Advanced LAN layer



# IEEE Project P802.16j

1. Multi-hop radio relay for wireless access.
2. Draft amendment to IEEE 802.16 standard
3. 16j is both an indoor solution and a coverage extension solution.
4. There is enough technical evidence, with extensive analysis performed, that the relay concept will work.
5. Next step is to standardize the 16j profile so that the development work can begin.

# Illustration of multi-hop relay coverage

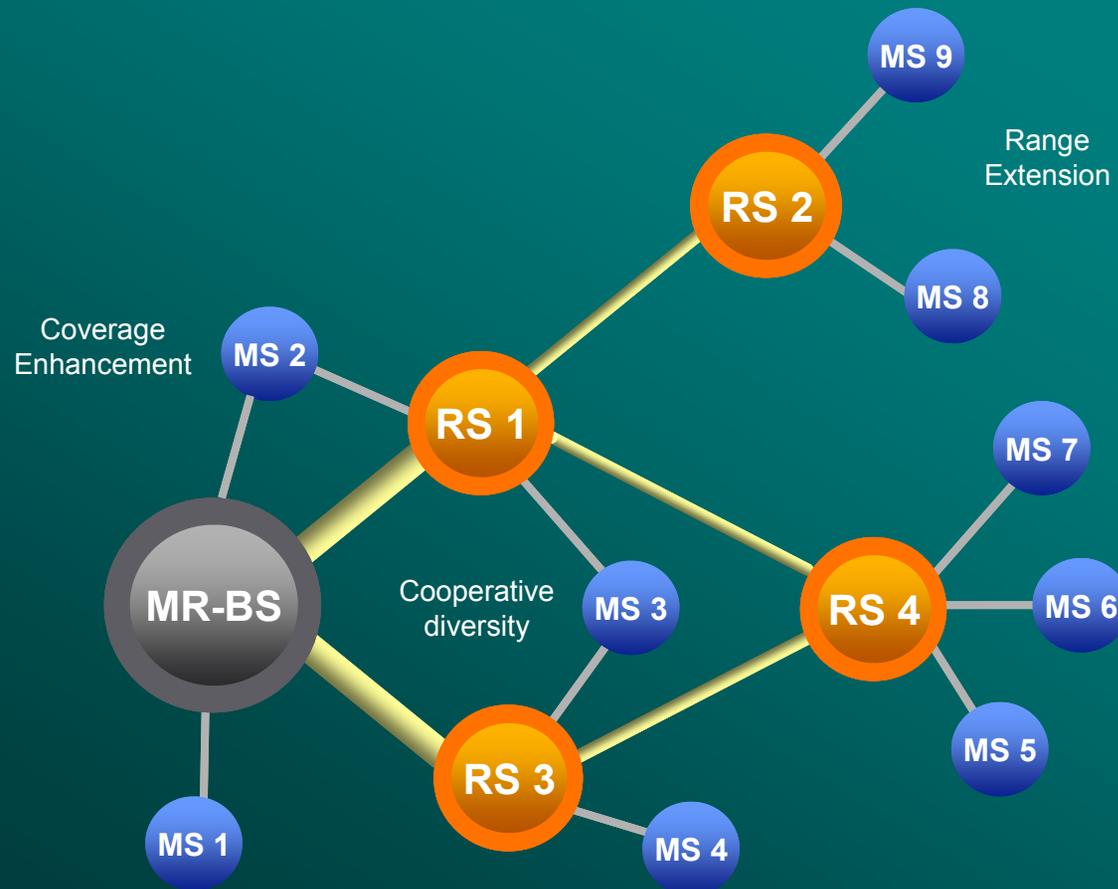


Legend:

MR-BS Multi-hop Relay Base Station (manages the RSs)

RS Relay Station (can be fixed, nomadic or mobile)

MS Mobile Station



# ITU-R Vocabulary

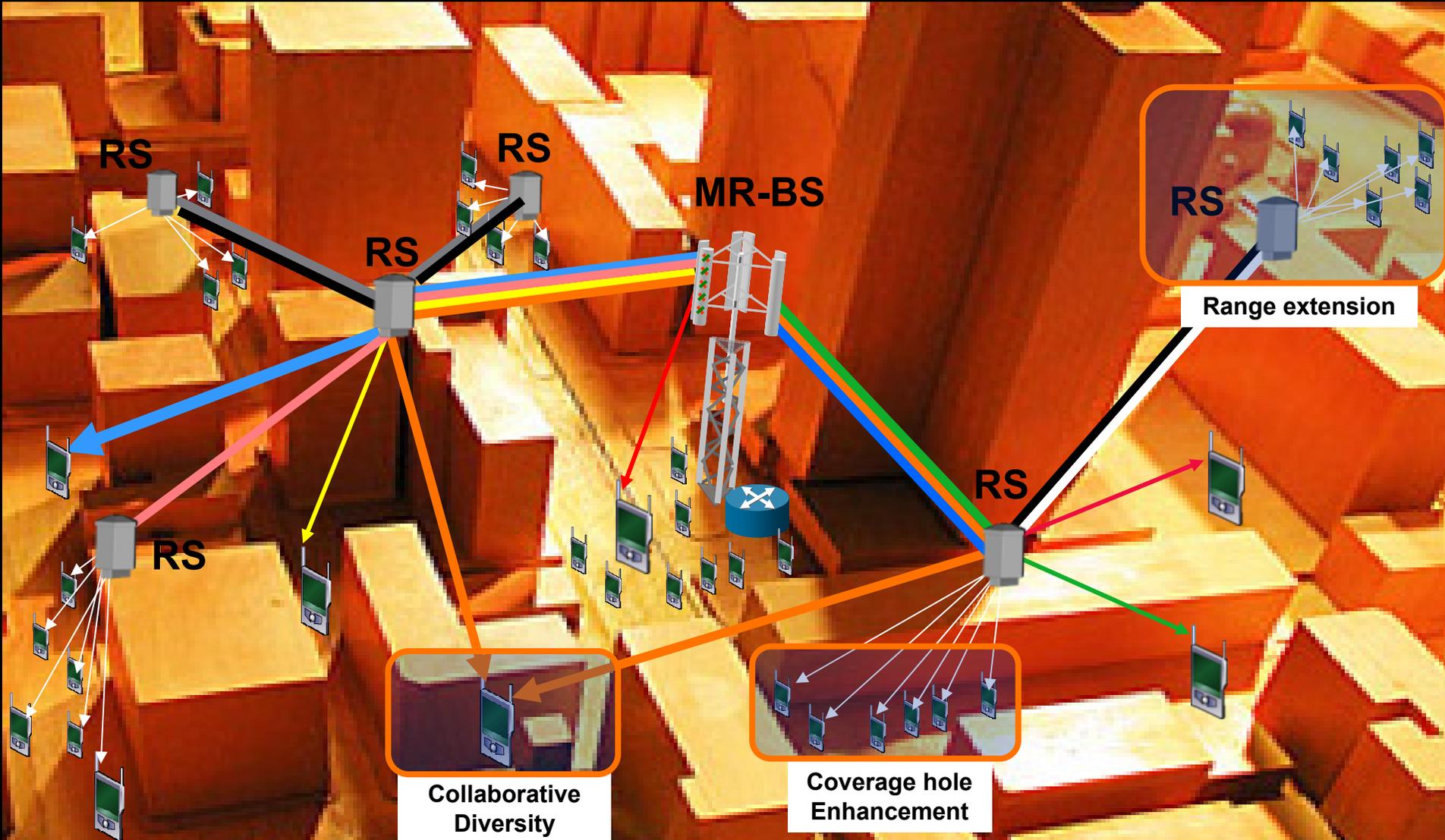
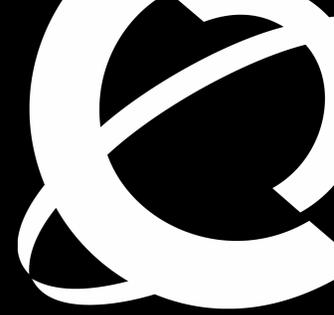
## (Recommendation ITU-R M.1797)



- **Mesh network, wireless mesh network**
  - A network in which there are two or more paths to any node.
  - NOTE – There are two types of mesh networks: full mesh and partial mesh. In a full mesh every node is connected to every other node in the network. In a partial mesh some nodes may be organized in a full mesh scheme but others can only connect to some nodes in the network.
- **Relay, relay station, wireless relay**
  - A station that performs message/signal transfer without any reference to a user application.
- **Relay network, wireless relay network**
  - A network of *relay stations*.
  - NOTE 1 – Relay networks can be one-hop or multi-hop. One-hop relays are implemented with P-P and/or P-MP techniques. Multi-hop relays are implemented using MP-MP techniques to form a mesh.
  - NOTE 2 – The *relay stations* in a network can be fixed, nomadic or mobile.
- **Infrastructure, network infrastructure**
  - A set of interconnected network elements that support telecommunications.
  - NOTE – The network infrastructure is generally understood as the fixed network excluding the terminals, and may include both the access network and the core network.
- **Ancillary infrastructure, ancillary network infrastructure**
  - A set of interconnected nomadic and mobile network elements, providing subsidiary support to telecommunications.
- **Client relay, client relay station, client wireless relay**
  - A *relay station* implemented on a client device.
- **Client relay network, client wireless relay network**
  - A network of *relay stations* implemented on client devices.
  - NOTE 1 – The relay stations in a client relay network can be fixed or nomadic.

# Fixed Infrastructure Usage Model

*Lower CAPEX & OPEX approach to expand infrastructure*



RS

RS

MR-BS

RS

RS

Range extension

RS

RS

Collaborative  
Diversity

Coverage hole  
Enhancement

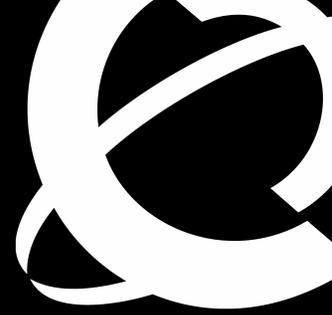
# In-Building Usage Model

- In carrier operator's networks, 70% of the traffic is indoor
  - Require the need for cost effective in-building solutions
- The carrier-host enterprise wireless access solution enables seamless ubiquitous mobile broadband service
  - Enables the extension of the carrier network deployment into enterprise space



# Coverage on Moving Platform Model

*RS node supports the mobility deployment*

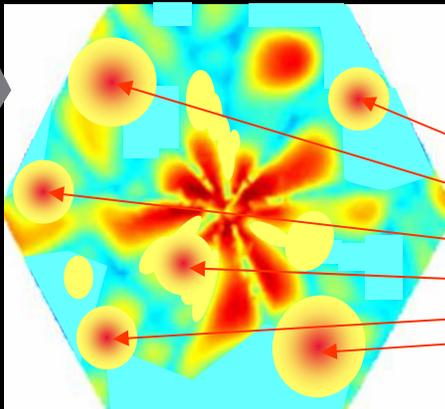
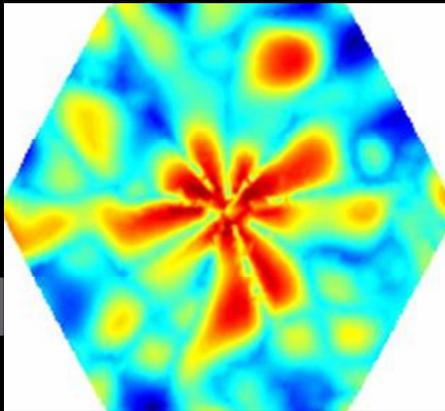


**Unique advantages over the conventional analog repeaters**

# Value Proposition to the End User

## *Network Performance*

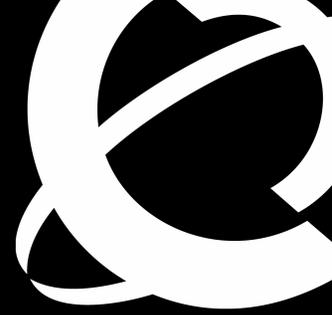
- Simple 2-hop Relay Improves Data Coverage



Relay Stations added

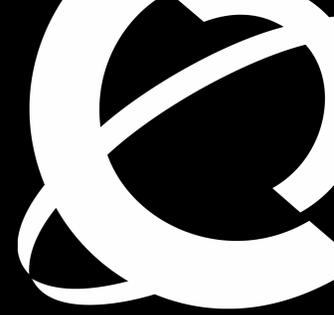
- Eliminates coverage holes
- Intelligent digital relay
- No planning required
- Deployed incrementally on-demand
- Can be rolled-out in parallel with existing networks

***Multi-hop relay can enhance the cell edge user throughput and the user SINR***



# Value Proposition to the Operator

## Network Cost



### Simulation conditions

Suburban environment

Terrain type A

Spectral efficiency

2.5 bit/s/Hz/km<sup>2</sup>

Coverage (outage) 95%

RS antenna gain

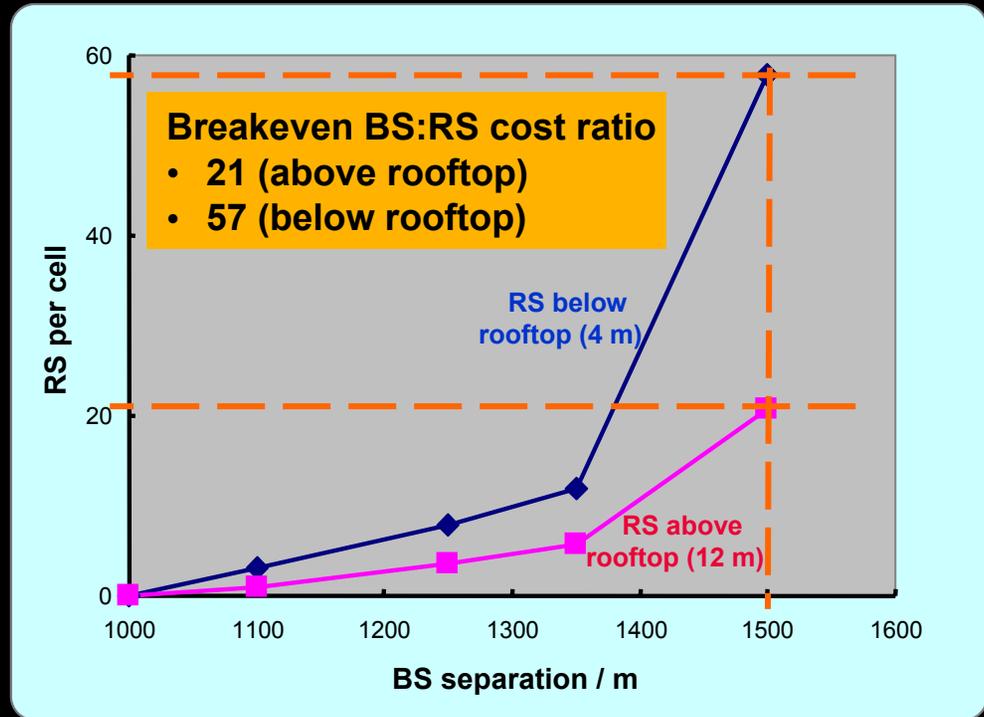
4 dB (receive)

2 dB (transmit)

RS transmit power

2x28 dBm (above rooftop)

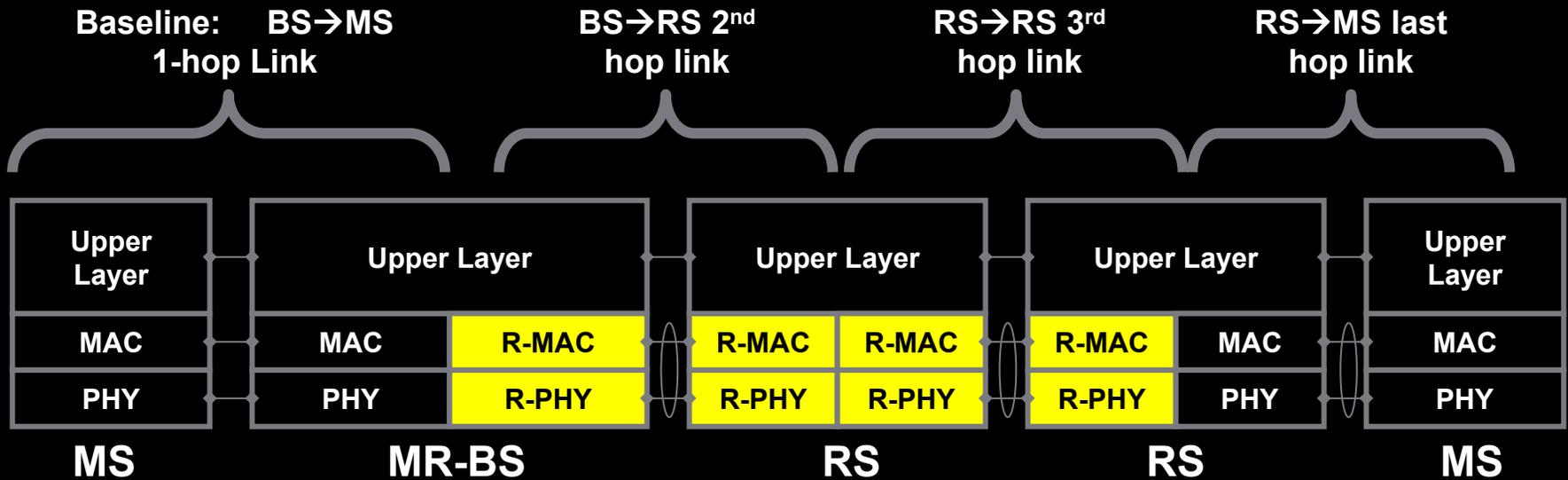
2x24 dBm (below rooftop)



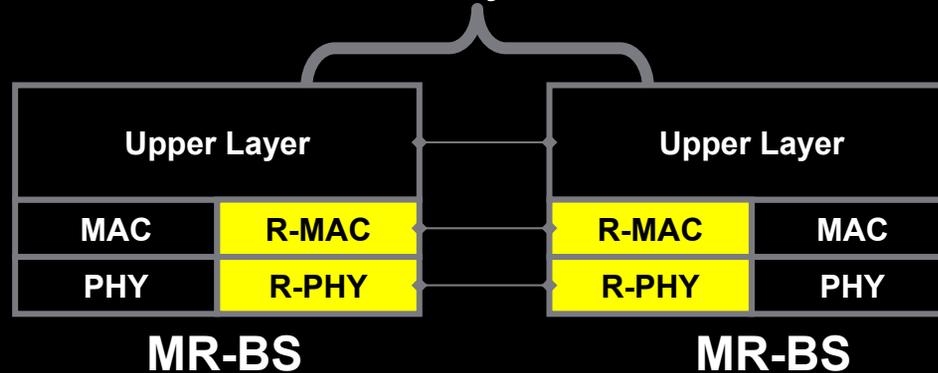
Adding relays compensates for greater base station separation

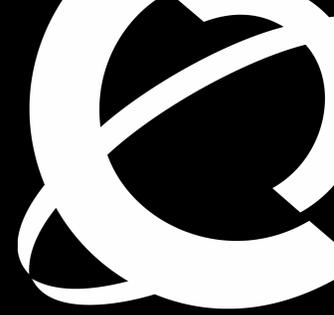
**Deployment of RS nodes can reduce the macro-cell BS deployment density**

# Example of Multi-hop Architecture



## BS→BS Relay Backhaul

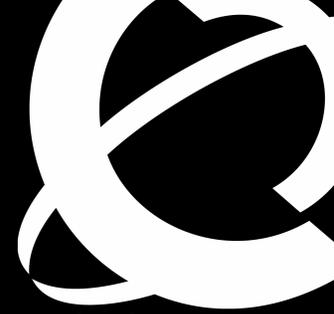




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# Spectrum requirements



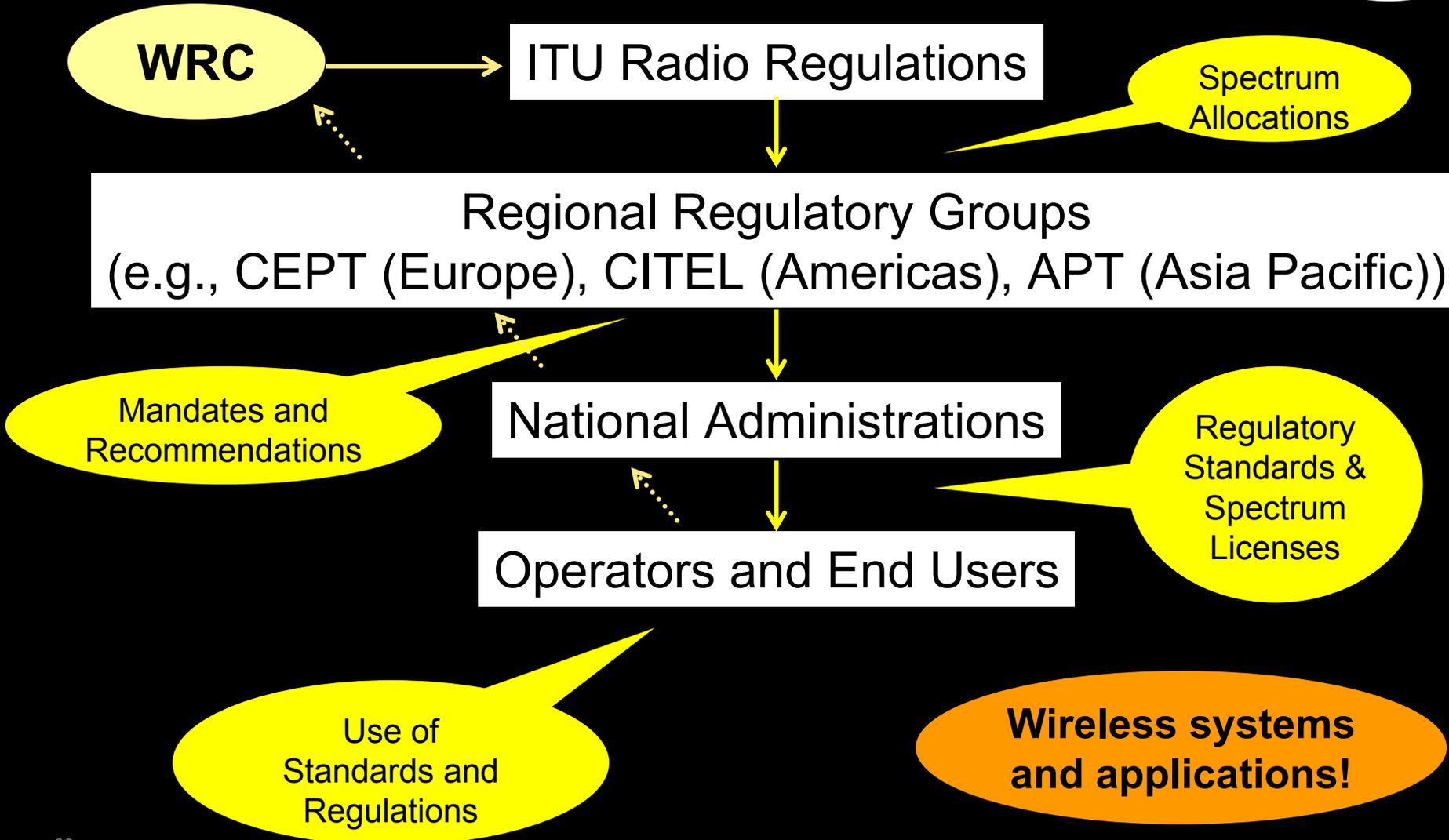
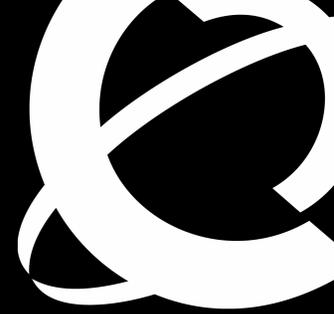
- **RLANs:** [Recommendation ITU-R M.1651](#) (2003)  
 “A method for assessing the required spectrum for broadband nomadic wireless access systems including radio local area networks using the 5 GHz band”
  - At WRC-03, 455 MHz were newly allocated to the Mobile Service on a primary basis for use by RLANs in the 5 GHz band: 5150-5250 MHz, 5250-5350 MHz and 5470-5725 MHz.
- **IMT:** [Recommendation ITU-R M.1768](#) (2006)  
 “Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000”
- [Report ITU-R M.2078](#) (2007) “Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced”

## Predicted spectrum requirements by the year 2020 for IMT

User demand setting	Predicted total (MHz)	Region 1		Region 2		Region 3	
		Identified (MHz)	Net additional (MHz)	Identified (MHz)	Net additional (MHz)	Identified (MHz)	Net additional (MHz)
Low	1 280	693	587	723	557	749	531
High	1 720	693	1 027	723	997	749	971

NOTE – Prediction based on one network deployment.

# From ITU Radio Regulations to End-Users of the Spectrum



# Preparations for WRC-07

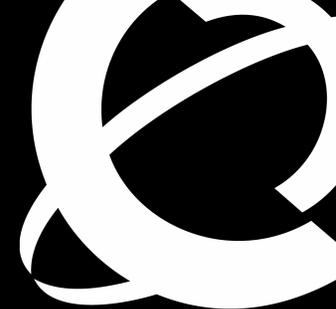
## Agenda Items (AI) 1.4, 1.9 and 1.11



- **AI 1.4** “to consider frequency-related matters for the future development of IMT 2000 and systems beyond IMT-2000 taking into account the results of ITU-R studies in accordance with Resolution 228 (Rev. WRC-03)”
- **AI 1.9** “to review the technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services in order to facilitate sharing with current and future terrestrial services without placing undue constraint on the services to which the band is allocated”
- **AI 1.11** “to review sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from broadcasting-satellite service networks and systems, in accordance with Resolution 545 (WRC-03)”

# Preparations for WRC-07 (AI 1.4)

<http://standards.nortel.com/spectrum4IMT>



## Mobile Industry Backing (mib) Terrestrial Spectrum for IMT (WRC-07 Agenda Item 1.4)

[Home](#)

[ITU-R WP 8F](#)

[CPM07-2](#)

[ITU News Article](#)

[Regional Preparations](#)

[WRC-07](#)

[About mib](#)

[Webmaster](#)

### Seminars:

- **APT: [Bangkok, Thailand, 7 January 2007](#)**
  - [Program, Presentations, and Photos](#)
- **Africa: [Yaoundé, Cameroon, 16 January 2007](#)**
  - [Program and Presentations, Photos](#)
- **CEPT: [Galway, Ireland, 30 January 2007](#)**
  - [Presentation](#)
- **CITEL: [El Salvador, 16 April 2007](#)**
  - **Español:** [Programa](#); [Informe](#); [Resolución](#); info@CITEL: [Enero](#), [Marzo](#), [Abril](#)
  - **English:** [Program](#); [Report](#); [Resolution](#); info@CITEL: [January](#), [March](#), [April](#)
  - [Presentations and Biographies \(Español / English\)](#); [Seminar photos](#); [Gala photos](#)
- **ATU: [<To be determined>](#)**

### Baseline Presentations:

- [Market growth calls for more mobile spectrum](#)
- [Higher bit-rates needed for better mobile experience](#)
- [WRC-07 is the right time to identify new mobile bands](#)

# Who needs IMT-Advanced?

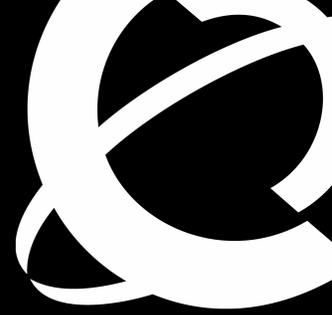


- Why pursue the high capabilities of IMT-Advanced, if all that seems to be useful is voice communications and simple data communications?
- Bar-Hillel's Conundrum applies\*: "We cannot afford to stop trying!" The pursuit of high goals has many benefits in related areas, many of which cannot be anticipated.
  - Example: **STARPAHC** Project in the 1970s: Space Technology Applied to Rural Papago Advanced Health Care.
- Many side-benefits will result from IMT-Advanced!
- We all need IMT-Advanced!



\* G.B. Thompson, "An Assessment Methodology for Evaluating Communications Innovations", IEEE Transactions on Communications, Vol. COM-23, No. 10, pp. 1045-1054, October 1975.

# Inter-American Telecommunication Commission (CITEL): Preparations for WRC-07 Agenda Item 1.4



- Permanent Consultative Committee II (PCC.II): Radiocommunication including Broadcasting
- Objective of PCC.II:
  - Serve as a technical advisory body within the Inter-American Telecommunication Commission with respect to the coordination and harmonization of standards related to spectrum use and the planning and efficient use of the radio spectrum and satellite orbits for radio services, including broadcasting.

# Inter-American Telecommunication Commission (CITEL)



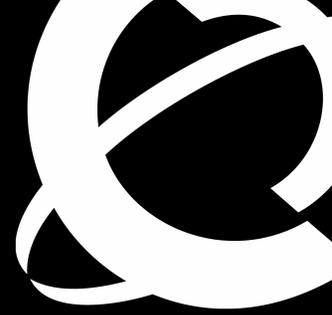
## Types of proposals for WRC-07

<b>PRELIMINARY PROPOSALS</b>	Support by one Administration
<b>DRAFT INTER-AMERICAN PROPOSALS (D-IAP)</b>	Support by more than one Administration
<b>INTER-AMERICAN PROPOSALS (IAP)</b>	Support by no fewer than 6 Administrations and is not opposed by more than 50% of the number of Administrations supporting it.

**Note: In the following charts, NOC = NO Change (to the Radio Regulations)**

# CITEL Preparations: Agenda Item 1.4

## Terrestrial component



- **410-430 MHz:**

*Brazil:* Identify this band

Draft-IAP (NOC): Mexico and USA (Opposed by Brazil)

- **450-470 MHz:**

*Brazil:* Identify this band

*Mexico:* Identify 450-470 MHz, 698-806 MHz and  
3 400-3 700 MHz

- **470-806/862 MHz**

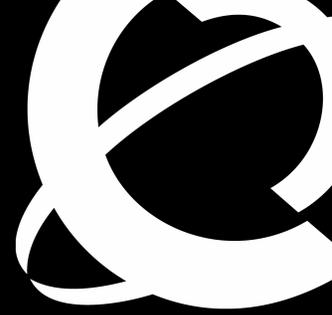
*Canada:* Identify parts of 698-806 MHz for IMT

*Brazil:* Do not identify 470-806 MHz for IMT

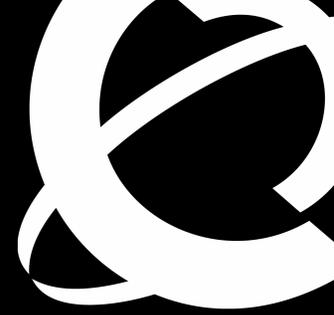
*Mexico:* Identify 450-470 MHz, 698-806 MHz and  
3 400-3 700 MHz

# CITEL Preparations: Agenda Item 1.4

## Terrestrial component



- **2 300 – 2 400 MHz**
- **2 700 – 2 900 MHz**  
IAP (**NOC**): Brazil, Canada, El Salvador, Dominican Republic, USA, Mexico, Paraguay, Peru, Uruguay
- **3 400 – 4 200 MHz**  
IAP (**NOC 3 600 – 4 200 MHz**): Argentina, Brazil, Colombia, Chile, Dominican Republic, El Salvador, Guatemala, Paraguay, Peru, Suriname, Uruguay (Opposed by Mexico).  
*Brazil*: identify 3 400-3 600 MHz for IMT.  
*USA*: Do not identify 3 400-3 650 MHz and 3 700-4 200 MHz  
*Mexico*: Identify 450-470 MHz, 698-806 MHz and 3 400-3 700 MHz
- **4 400 – 4 990 MHz**  
Draft-IAP (**NOC**): USA, Mexico  
*Brazil*: Do not identify 4 500-4 800 MHz band for IMT



# CITEL Preparations: Agenda Item 1.4

## Terrestrial component

- Methods to satisfy the Agenda Item 1.4:  
*Canada:* Adopt Method 1A.  
*Mexico:* Identify for IMT and other broadband wireless access systems approved by ITU-R
- SATELLITE:
  - 1 525 – 1 610 MHz  
Draft-IAP (Integrated MSS-and-Terrestrial Systems): Canada, Mexico.

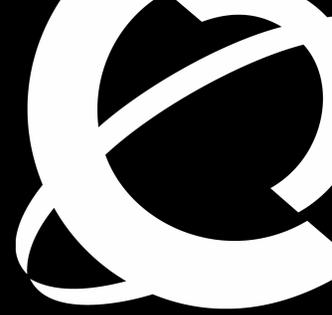
# CITEL Preparations: Agenda Item 1.9

## 2500 – 2690 MHz

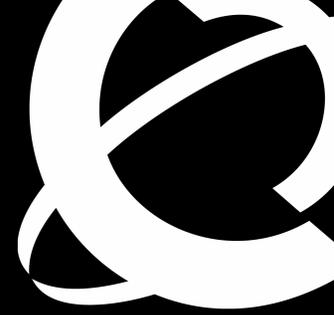
- IAP (Suppress MSS allocations in Region 2 in the bands 2500-2520 MHz and 2670-2690 MHz): Argentina, Brazil, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Mexico, Peru and Uruguay.
- *USA*: Limit MSS allocation in Region 2 in bands 2 500-2 520 MHz and 2 670-2 690 MHz to national or regional systems, subject to No. 9.21.
- IAP (adopt hard limits (Article 21) for all satellite services in the band: -136/-122 dB(W/m<sup>2</sup>)): Argentina, Brazil, Costa Rica, Dominican Republic, El Salvador, USA, Honduras, Mexico, Peru, Uruguay.
- IAP (date of entry into force): Argentina, Brazil, Costa Rica, Dominican Republic, Honduras, Mexico, Uruguay.



# Expectations for WRC-07



- The necessity of lower and higher bands has been noted because of radio coverage, applicable in both distance (rural) and capacity of traffic (high density).
  - Identify bands for IMT below those already identified, e.g., 450-470 MHz, 700 MHz, for coverage/reach (AI 1.4).
  - Identify sufficient amount of spectrum for IMT in other bands for capacity (AI 1.4).
- Protect terrestrial wireless operators' businesses in the band 2500-2690 MHz, through suitable pfd limits for satellites (MSS and BSS) and date of entry into force (AI 1.9).
- Protect the terrestrial wireless operators' businesses from BSS in the 700 MHz band (AI 1.11).

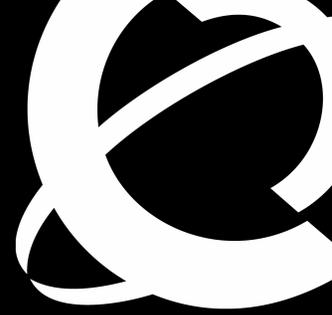


# Outline

- **Broadband Wireless Access**
- **Standardization**
  - ITU-R
  - IEEE
- **Spectrum**
  - Preparations for WRC-07
  - Agenda Item 1.4 (spectrum for IMT)
  - Agenda Item 1.9 (satellite/terrestrial sharing in 2500-2690 MHz)
  - CITELE Activities
- **Results of ITU-R WP 8F (Kyoto, 23-31 May 2007)**
- **Preparations for ITU-R WP 8A (Geneva, 12-20 June 2007)**

# ITU-R WP 8F meeting

23-31 May 2007, Kyoto



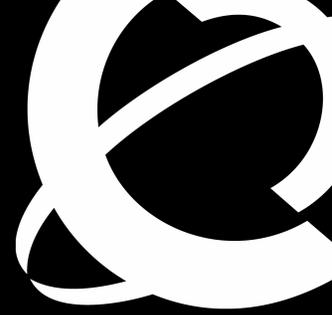
- Workshop on IMT-Advanced (22 May 2007)
- Services: Draft New Recommendation
- Sharing Studies
- Workplan and Circular Letter to invite technology submissions
  - Minimum requirements
  - Evaluation Guidelines
- Radio interfaces: Proposed updates of Recommendations

# Draft New Recommendation ITU-R M.[IMT.SERV] “Framework for services supported by IMT“ (Doc. 8F/TEMP/537R2).



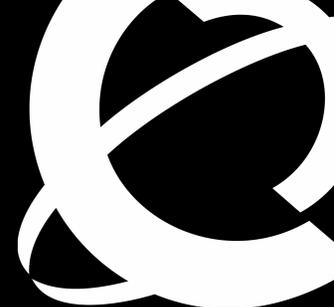
- Recommends high level requirements:
  - Seamless Connectivity (including mobility management, interoperability, constant connection, and application scalability)
  - Security
  - Prioritization
  - Location
  - Broadcast/Multicast
  - Presence
  - Usability (including Voice Recognition and User-Friendly Human to Machine Interface)
  - Support for a wide range of services (including examples and recommended service parameters and service classifications ).

# Frequency Spectrum: Sharing Studies Completed



<b>Draft New Reports</b>	<b>Doc. 8F/TEMP/</b>
Sharing studies between radiocommunication services and IMT systems operating in the 450 – 470 MHz band	538 (Rev.3)
Sharing studies between IMT-Advanced and radiolocation services in the 3 400 – 3 700 MHz bands	540 (Rev.2)
Compatibility studies between IMT–2000 and digital terrestrial television broadcasting	543 (Rev.2)
Compatibility/sharing of airport surveillance radars & meteorological radar with IMT Systems within the 2 700 – 2 900 MHz band	546 (Rev.1)
Sharing studies in the 2 500-2 690 MHz band between IMT-2000 and fixed broadband wireless access (BWA) systems including nomadic applications in the same geographical area	557 (Rev.1)
Sharing studies between IMT–Advanced systems and geostationary satellite networks in the fixed satellite service in the 3 400 – 4 200 and 4 500 – 4 800 MHz frequency bands	559 (Rev.2)

# IMT-Advanced process in WP 8F

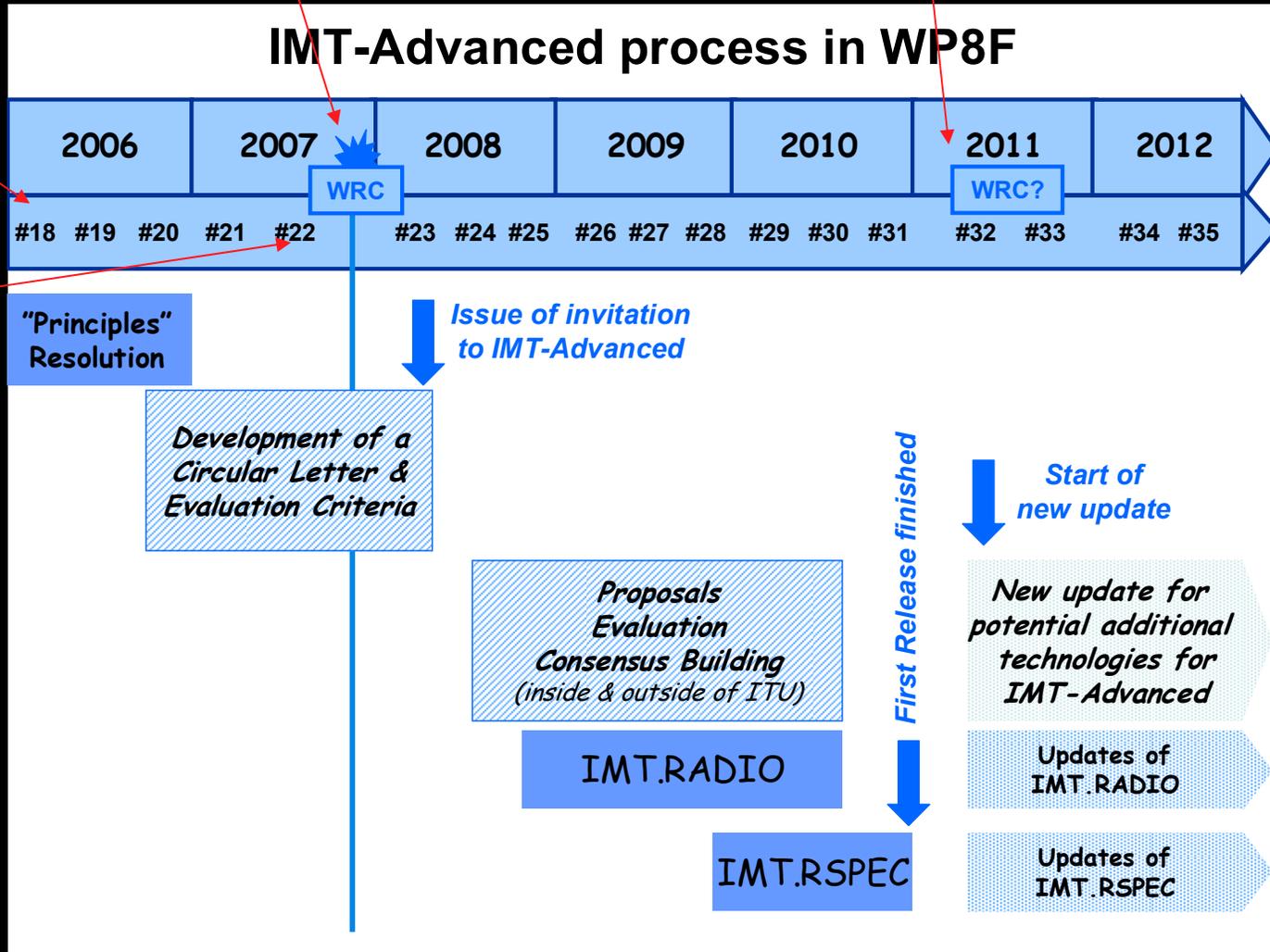


WP 8F mtgs.

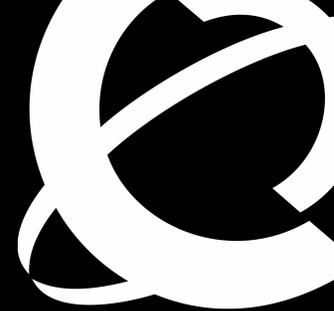
Kyoto meeting

RA-07  
WRC-07

WRC

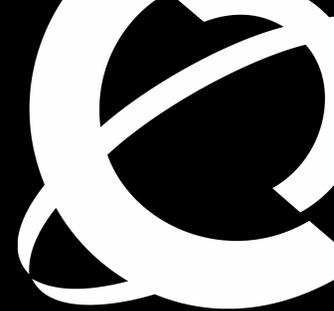


# Development of a Circular Letter to invite submissions of radio interface technologies for IMT-Advanced



Section	Title	Materials to be provided	Responsible Group	WG/DG → AH-CL	
				Prelimi.	Final
Main body		- "Common text" for Intro., - Spectrum text (WRC-07)	WG-SERV/SPEC (SWG-ComTxt) → AH-CL	-	May 28 - Jan.29
Annex 1	Background on IMT-Advanced	Complete text based on "Common text"	WG-SRV (SWG-ComTxt)	May 30 (#22)	Jan.29 (#23)
Annex 2	Submission and evaluation process, consensus building	Time schedule (due dates)	AH-Workplan → AH-CL	May 30 (#22)	Jan 28 (#28)
Annex 3	Service requirements	Complete text based on IMT.SRV	WG-SRV (SWG-Market)	May 30 (#22)	Jan.29 (#23)
Annex 4	Technical requirements	Complete text based on IMT.TECH	WG-TECH (SWG-RA)	May 30 (#22)	Jan.29 (#23)
Annex 5	Spectrum requirements	Complete text based on WRC-07 results (structure)	WG-SPEC (DG-SPEC-CL)	May 30 (#22)	Jan.29 (#23)
Annex 6	Submission guidelines and template	Text, minimum requirements,	WG-TECH, SERV,SPEC → AH-CL	May 29 (#22)	Jan.29 (#23)
Annex 7	Evaluation criteria and Methodology, test model	Complete text based on IMT.TECH & IMT.EVAL	SWG-Market, DG-CL-SPEC → WG-TECH (SWG-EVAL)	May 30 (#22)	Jan.29 /Jun.16
Annex 8	Relevant ITU-R Documents	List of ITU-R documents relevant to Annexes	WG-SERV, TECH,SPEC → AH-CL	May 30 (#22)	Jan.29 (#23)
Annex 9	IPR policy		AH-CL	-	-

# Development of Minimum Requirements and Evaluation Guidelines for IMT-Advanced

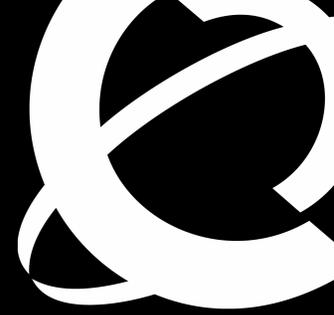


- Requirements related to technical system performance for IMT-Advanced radio interface(s) [IMT.TECH]
  - Doc. 8F/TEMP/574
- Guidelines for evaluation of radio interface technologies for IMT-Advanced [IMT.EVAL]
  - Doc. 8F/TEMP/568

# IMT-2000 terrestrial radio interfaces: Draft revisions of Recommendations



- Draft Revision of Recommendation ITU-R M.1457-6  
“Detailed specifications of the radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)”
  - Includes a 6<sup>th</sup> terrestrial radio interface: OFDMA TDD WMAN (based on the IP-OFDMA proposal by IEEE)
  - The submission from WP 8F to SG 8 includes reservations from one administration and various sector members
- Draft Revision of Recommendations ITU-R M.1580-1 and M.1581-1: Generic unwanted emission characteristics of <base stations (M.1580) / mobile stations (M.1581)> using the terrestrial radio interfaces of IMT-2000 (with some parts still for further study).



# Outline

- **Broadband Wireless Access**
- **Standardization**
  - ITU-R
  - IEEE
- **Spectrum**
  - Preparations for WRC-07
  - Agenda Item 1.4 (spectrum for IMT)
  - Agenda Item 1.9 (satellite/terrestrial sharing in 2500-2690 MHz)
  - CITELE Activities
- **Results of ITU-R WP 8F (Kyoto, 23-31 May 2007)**
- **Preparations for ITU-R WP 8A (Geneva, 12-20 June 2007)**

# ITU-R WP 8A

## 2006 Results



- **Recommendation ITU-R M.1042-3** “Disaster communications in the amateur and amateur-satellite services”
- **Recommendation ITU-R M.1795** “Technical and operational characteristics of land mobile MF/HF systems”
- **Recommendation ITU-R M.1797** “Vocabulary of terms for the land mobile service”
- **Recommendation ITU-R M.1801** “Radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service operating below 6 GHz”
- **Report ITU-R M.2014-1** “Digital land mobile systems for dispatch traffic”
- **Report ITU-R M.2085** “Role of the amateur and amateur-satellite services in support of disaster mitigation and relief”
- **Question ITU-R 241/8** “Cognitive radio systems in the mobile service”
- Draft new Recommendation ITU-R M.[LMS.CHAR.VHF-UHF] - Technical and operational characteristics of conventional and trunked land mobile systems operating in the mobile service allocations below 960 MHz to be used in sharing studies. (Adopted by SG 8; approval by correspondence by 16 June 2007, see **CAR/237** and **Doc. 8/BL/41**)

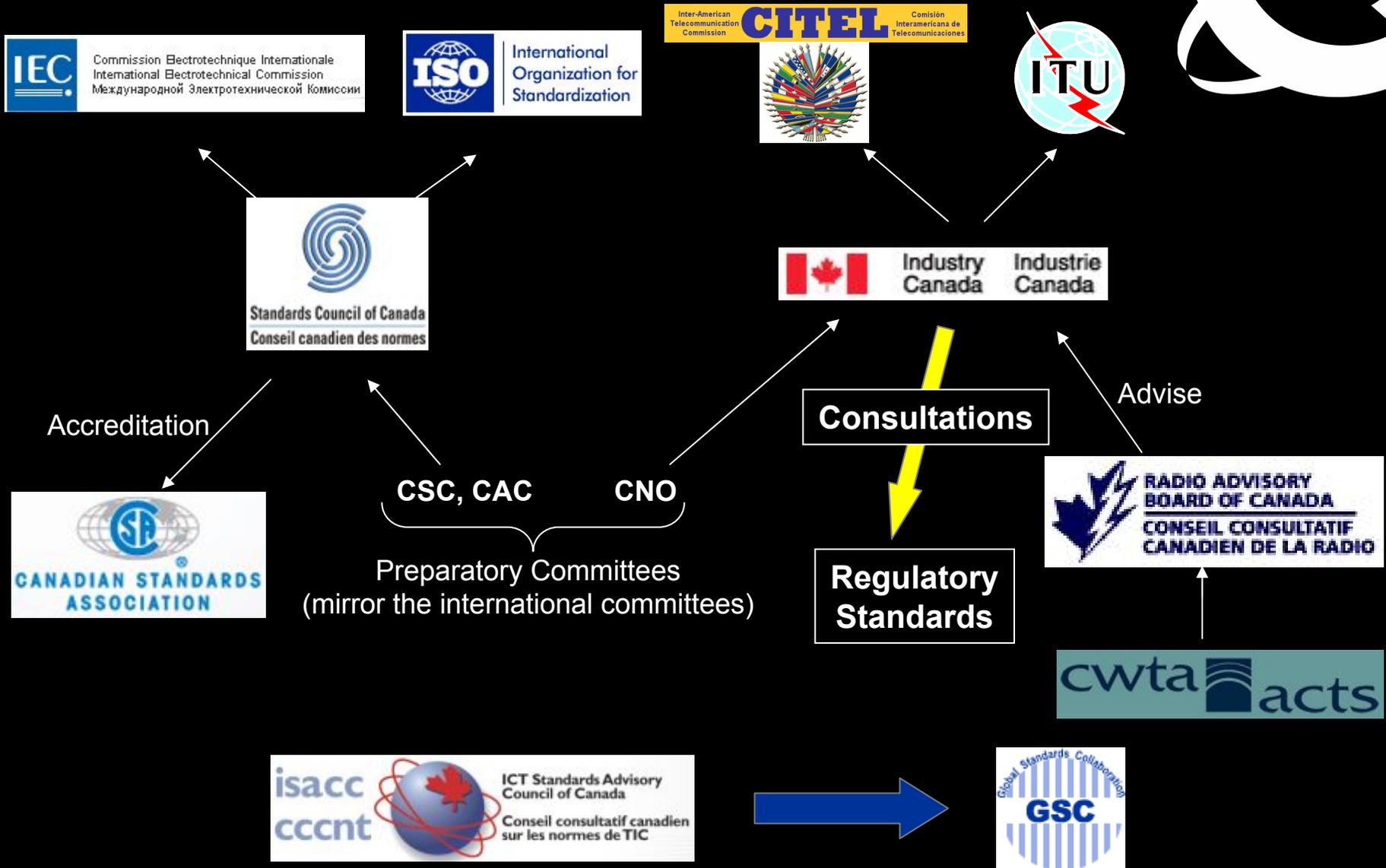
# ITU-R WP 8A meeting

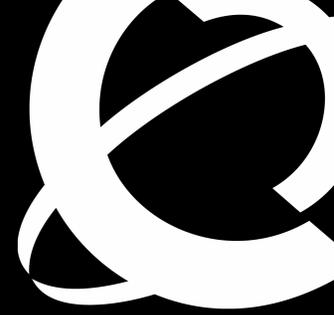
## 12-20 June 2007, Geneva



- Update of Recommendation ITU-R M.1450 (RLANs)
- Characteristics of BWA systems for sharing studies
- Sharing methodologies in the land mobile service
- Testing procedures for the implementation of Dynamic Frequency Selection (DFS)
- Software Defined Radio
- Cognitive Radio Systems
- Development of a handbook on Broadband Wireless Access (BWA): Volume 5 of the Handbook on Land Mobile (including Wireless Access)

# The Canadian Scene



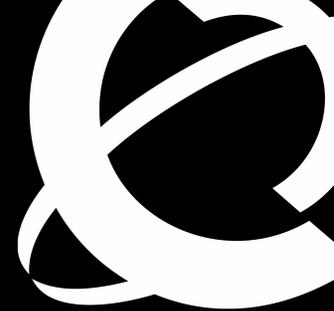


# Summary

- Have described broadband wireless access, including standardization activities in ITU-R and IEEE.
- Have described ongoing preparations for WRC-07 on Agenda Items 1.4 and 1.9, in particular within CITELE.
- Have described the results of the WP 8F meeting (Kyoto) and preparations for the WP 8A meeting in Geneva.

**BWA standards and spectrum will enable ubiquitous deployment of mobile multimedia services**

# References



- ITU Radio Regulations, 2004  
<http://www.itu.int/publications/folderdetails.aspx?lang=e&folder=R-REG-RR-2004&menu=categories>
- Recommendation ITU-R M.1457, “Detailed specifications of the radio interfaces of IMT-2000”, 2006.  
<http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-M.1457>
- Recommendation ITU-R M.1645, “Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000”, 2003.  
<http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-M.1645>
- ITU-R Wireless Access Systems Portal  
<http://www.itu.int/ITU-R/study-groups/was/index.html>
- ITU-R Handbook on “Land Mobile (including Wireless Access) Volume 2: Principles and Approaches on Evolution to IMT-2000 ”, 1997  
<http://www.itu.int/pub/R-HDB-30-1997/en>
- ITU Handbook on “Deployment of IMT-2000 Systems”, 2003.  
<http://www.itu.int/itudoc/qs/imt2000/84207.html>
- “Migration to IMT-2000 Systems” - Supplement 1 to the Handbook on Deployment of IMT-2000 Systems  
<http://www.itu.int/pub/R-HDB-46-2005/en>

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