Wireless Standards Development
A New Paradigm

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Timeline of the Changing Wireless Landscape
Generations of Terrestrial Commercial Wireless Systems

Time

Capability Enhancements by Generation

1GW

Mobile telephone
Analog cellular technology
Macro cells

1980

Digital voice, messaging & data services
Fixed wireless loop, wireless LAN services
Digital cellular & PCS
Macro, micro & pico cells

2GW

Greatly enhanced data communications services
Narrowband and wideband multimedia services
Higher spectrum for wideband applications
Macro, micro & pico cells

1990

3GW

Very high bit rate (> 2 Mb/s) multimedia enhancements

2000

IMT-2000 and Beyond

2010

2020

Future Evolution

Globalization

Standardization Activities Relative to the Generations

Historical (2G)
Recent Past (3G)
Current and Future (3G and Beyond)

Time
The 2G Standards Landscape
“Historical” Perspective on Development of Standards for Commercial Wireless (2G)

- Driven by technology and engineering
- Designed to meet the operating needs and requirements of the network operators/manufacturers (e.g., system capacity, coverage...)
- Network operators/manufacturers determined what the customer needed in the capabilities of the standards
- National or regional perspective and myopia in design
  - “Local” needs drove the standards
  - Examples: GSM Europe, TDMA/CDMA USA, PDC, PHS Japan
  - Nation/region standards adapted to penetrate other geographic regions outside original scope
- Major technical developments and standards inputs predominately by manufacturers (often just one or at most a few)
- Before “Internet” - voice only; data was minor consideration
The 3G and IMT-2000 Standards Landscape
“Recent Past” Perspective on Development of Standards for Commercial Wireless (3G)

• Driven by the requirements of the consumer and the marketplace
  – Vision created by ITU-R TG8/1 IMT-2000 activities
• Network operators and manufacturers act as surrogates for the end user requirements
  – responsive to the marketplace not just to internal technology needs
• Global perspective in design at the onset
  – Marketplace for systems is the global communications populace
  – “Globalized” across geographic markets by intent not just adapted after the fact
• Major collaborative effort of manufacturers, network operators, service providers, SDO’s and other proponents
• After “Internet” - data capability is major thrust moving beyond and potentially subsuming voice
ITU-R IMT-2000 Objectives
“The Starting Point Vision”

“A goal for third generation mobile systems is to provide universal coverage and to enable terminals to be capable of seamless roaming between multiple networks .... It is a design objective of IMT-2000 that the number of radio interfaces should be minimal and, if more than one interface is required, that there should be a high degree of commonality between them.”
IMT-2000
A Flexible, Multi-Functional Network

2 Mbps - picocell & indoor
384 Kbps - pedestrian & low speed vehicular
144 Kbps - high speed vehicular
ITU Study Group Organization related to IMT-2000 Through 1999

Telecommunication Standardization Sector

ITU-T

- Multimedia Svcs. & Speech Coding (SG 16)
- Networks (SG 13)
- Performance (SG 12)
- Signaling & Protocols (SG 11)
- Data incl. Security (SG 7)

ITU

ITU-R

- Mobile Radio (SG 8)
- Land Mobile (WP 8A)

WRC

- IMT-2000 (TG 8/1)

Radiocommunication Sector

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Internal ITU (TG8/1)

- Request RTTs
- Review evaluations
- Assess compliance
- RSPCs

Outside ITU ("External Organizations")*

- Develop, submit & evaluate RTTs
- Evaluation Reports
- Implementation of RSPCs Recs.

2000 forward

Note the acknowledgement of an internal/external process flow.

* External Organizations:
e.g., technology proponents, partnership projects, SDOs...
Consensus Building was the nexus of the change in the paradigms of standards development.
3G Terrestrial Standards Development in 1998
Prior to Consensus Building Activities
IMT-2000 Standards Development Partnering and Consensus Building in 1999

Radio Interface Specifications/Standards

Various Systems

Satellite

UWC-136 (EDGE -NA/Europe)

DECT

TD SCDMA

CDMA-DS

CDMA -TDD

CDMA -MC

USA

TIA

USA

T1

Europe

ETSI

Japan

ARIB

Korea

TTA

China

CWTS

Members of Partnership Projects

United Nations

ITU-R Recommendation M.[RSPC]

ITU-R Material - 10%
Overview from Submitters - 20%
References to External Standards - 70%

Content of RSPC

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IMT-2000 Terrestrial Radio Interface in RSPC (YE1999)

- **IMT-2000 CDMA Direct Spread**  
  - Industry Nomenclature: UTRA FDD or Wideband CDMA  
    - (responsible organization 3GPP)

- **IMT-2000 CDMA Multi-Carrier**  
  - Industry Nomenclature: cdma2000  
    - (responsible organization 3GPP2)

- **IMT-2000 CDMA TDD**  
  - Industry Nomenclature: UTRA TDD and TD-SCDMA  
    - (responsible organization 3GPP and CWTS)

- **IMT-2000 TDMA Single Carrier**  
  - Industry Nomenclature: UWC-136  
    - (responsible organization UWCC)

- **IMT-2000 FDMA/TDMA**  
  - Industry Nomenclature: DECT  
    - (responsible organization ETSI)
IMT-2000 Terrestrial
Radio Interfaces

Paired spectrum

Unpaired spectrum

IMT-2000
CDMA
Direct Spread
W-CDMA
(UTRA FDD)

IMT-2000
CDMA
Multi-Carrier
CDMA 2000

IMT-2000
CDMA TDD
UTRA TDD
TD-SCDMA

IMT-2000
TDM A
Single-Carrier
UW C-136

IMT-2000
FDM A/TDM A
DECT

CDMA
TDMA
FDM A

Revised to reflect RSPC technology nomenclature

- Satellite Radio Interface A  
  - Industry Nomenclature: SW-CDMA

- Satellite Radio Interface B  
  - Industry Nomenclature: W-C/TDMA

- Satellite Radio Interface C  
  - Industry Nomenclature: SAT-CDMA

- Satellite Radio Interface D  
  - Industry Nomenclature: SRI-D

- Satellite Radio Interface E  
  - Industry Nomenclature: SRI-E

- Satellite Radio Interface F  
  - Industry Nomenclature: SATCOM 2000
IMT-2000 Became and Is Now a Global Partnership

- **ITU-R** ensures a global perspective on IMT-2000 for the developmental and evolution vision, for worldwide compatibility, for international roaming, for user needs, for baseline requirements, for core specifications, and fosters global consensus.

- **Partnership Projects** ensure a global perspective on the technology developments and are a primary developer of the radio interface technical specifications.

- **SDO's** ensure regional and local suitability and applicability of the global core specifications. Their efforts result in IMT-2000 standards that are based upon the technical specifications produced by the Partnership Projects.

- **Recommendation ITU-R M.[RSPC]** reflects this partnering of organizations and the division of work and responsibility.

- **Formal business arrangements** between ITU-R and external organizations reflect the responsibilities and roles and ensure the integrity of ITU-R IMT-2000 standards and ITU processes.
RSPC Development - The Start of a New Paradigm in International Standards Development

- Unique Attributes of the RSPC Standards Development Process Formed the Foundation:
  - Establishment of dynamic new relationships between the ITU and External Organizations
  - Liberalization of the use of references in ITU Recommendations
  - A new, fast-track process
  - New roles for each of the major types of standards organizations
    - The International Telecommunications Union
      - Radiocommunications Sector (R Sector)
      - Standardization Sector (T Sector)
    - Standards Development Organizations (e.g., TIA, ETSI, etc.)
    - The Partnership Projects
    - Technology Proponents

- For a New Paradigm for Wireless Standards Development
  - Applicable to other rapidly changing market and technology environments.
  - Process will evolve and mature going forward in this new decade.
The Future Standards Landscape
We Are In A New Era.....
“Current and Future” Perspective on Development of Standards for Commercial Wireless (IMT)

- Continues to be driven by the requirements of the consumer and the marketplace
  - Future Vision created by ITU-R WP8F and other Entities
- Many entities now function and act as surrogates for the end user requirements
  - responsive to the total communications marketplace
  - e.g. CNN, AOL, auto manufacturers and other content providers..
- Global perspective in design now the baseline
  - design for global marketplace; customize locally
- Time to market is of the essence even for complex systems
- Major partnership effort of manufacturers, network operators, service providers, SDO’s and other proponents
  - more formalized and structured …more than just collaboration among entities
- Beyond just “Internet” and “Internet Services” -
  - major realignment of access/networks, etc … the “IP” ing of systems
International Standards Development for IMT-2000 and Beyond Can Be Modeled As A Pyramid

The four sides are:
- Market Place
- Spectrum
- Regulatory
- Technology

Moving from the tip towards the base provides an international to regional to national perspective.
The Pyramid Model of IMT Standards

International
Regional
National

“Market Place”
International (ITU-R)
Regional (EU, CITEL, APT)
National

“Spectrum”

International (ITU-R)
Regional
National

“Regulatory”

Spectrum
Regulatory
Technology
come together at the pinnacle, which is ITU-R.

See Details
Next Chart
Details of the “Technology” Side of the Pyramid

ITU

ITU-R

ITU-T

WP 8F
WP 8D

Technology Proponents

3GPP
3GPP2

Others
(e.g., UWCC, 3G.IP...)

Standards Development Organizations (SDOs)

ARIB
CTWS
ETSI
TIA
TTA
TTC

Marketing Organizations

UWCC

GSM Assoc.

GSM-NA

UMTS
CDG

OTHERS

“Technology”
Organizations and Process for International Partnering in Development of IMT Requirements, Specifications, Standards, and Recommendations

**ITU-R Working Party 8F**

- **Vision Working Group**
  - Long-Term Perspectives
  - IMT Concepts and Principles (ITU-R Recommendations)
  - Mid-Term Perspectives
  - IMT Framework and Requirements (ITU-R Recommendations)

- **Radio Technology Working Group**
  - Proposal, Evaluation and Consensus Building Process
  - ITU-R Recommendations

**Market Organizations**

- **CDMA Development Group**
  - UWCC
  - UMTS Forum
  - Operator Harmonization Group
  - Content Providers
  - Others

- **Externally Recognized Organizations**
  - Technology Proponents (Partnership Projects and Others)
  - SDOs
  - IMT Standards

**Global Recognized Coordinated Standards Documents**

Global Perspective

Global Perspective with Regional and National Specifics
ITU Study Group Organization Related to IMT-2000
For Years 2000 and Beyond

- Telecommunication Standardization Sector
  - ITU-T
    - Services & Operations (SG 2)
    - Charging & Tariffs (SG 3)
    - Management (SG 4)
    - Data incl. Security (SG 7)
    - Multimedia Svcs. & Speech Coding (SG 16)
    - Networks (SG 13)
    - Performance (SG 12)
    - Signaling & Protocols (SG 11)
- Radiocommunication Sector
  - ITU-R
    - Mobile Radio (SG 8)
    - IMT-2000 & beyond (Satellite) (WP 8D)
- WRC
  - IMT-2000 & beyond Primary Responsibility (Terrestrial) (WP 8F)

The ITU-T is considering the creation of a separate study group for the standardization of the network aspects of IMT-2000.
ITU-R Working Party 8F

- WP8F, replacing TG 8/1, is the global focal point for the continuing vision of next generation wireless services and systems, acting as a forum for user requirements and as a catalyst for translating those requirements into technical reality.

- WP8F has the challenging task of supporting the near term needs of the IMT-2000 marketplace while exploring where we might go in the wireless world of the future.

- Chairman
  - Mr. Stephen BLUST, USA

- Vice-Chairpersons:
  - Mrs. Shumin CAO, China
  - Mr. Stuart COOKE, UK
  - Mr. Kyu-Jin WEE, Korea
ITU-R WORKING PARTY 8F

• **WP8F’s charter is to:**
  – be responsible for the overall system aspects of IMT-2000
  – continue the global development of IMT-2000
    - working with proponent organizations, partnership projects and standards development organizations
  – develop the vision of IMT beyond IMT-2000
  – focus on terrestrial components
  – coordinate with ITU-R WP8D re satellite; and also with ITU-T and ITU-D

• **Included in the work assigned to WP8F are issues such as:**
  – developing country needs
  – spectrum needs
  – higher data rate capabilities
  – Internet Protocol (IP)-based service needs of mobile systems

• **Inaugural Meeting concluded 7-10 March in Geneva**
• **Next meeting 21- 25 August 2000, San Diego, California USA**
• **Info:  http://www.itu.int/imt**
Note:
Boxes and ellipse are Working Groups
Terms of Reference may be found on
http://www.itu.int/imt
WP8F Working Groups - Terms of Reference (1)

- **Vision Working Group** (Dr. Kyu-Jin WEE, Korea)
  - Provide the roadmap to the future in relation to the time perspectives for IMT-2000 and systems beyond IMT-2000.
  - Coordinate and complement the near term aspects of the Radio Technology Working Group and coordinate with the other groups in WP 8F.
  - Conceptualize the longer term future (5 to 10 years) and migrate it through a middle defining stage (3 to 7 years) to ultimately deliver a near term work product of specifications as defined in related working groups.
  - Maintenance and update of other IMT-2000 Recommendations (such as concepts, principles, framework requirements and the like).

- **Circulation Working Group** (Mr. Pekka LANDSMAN, Finland)
  - Address issues that may facilitate the ability of IMT-2000 to achieve global deployment including access, circulation, and common emission requirements.

- **Developing Country IMT Working Group** (Chair to be finalized at August meeting)
  - Act as a focal point for the consideration of issues relevant to the needs of the developing countries. Ensure that the work on IMT-2000 adequately reflects these needs. Conduct studies in response to Question ITU-R 77/8 and strengthening the liaison with ITU-D as necessary.
  - Maintenance and update of relevant IMT-2000 Recommendations as appropriate may occur within this working group.
WP8F Working Groups - Terms of Reference (2)

- **Radio Technology Working Group** (Mrs. Shumin CAO, China)
  - Maintenance and update of IMT-2000 RSPC terrestrial component in conjunction with external organizations. Maintenance and update of IMT-2000 RSPC satellite component in conjunction with WP 8D. Maintenance and update of other IMT-2000 Recommendations as appropriate may occur within this working group.
  - Receives the work products of the "mid-term" perspective of the Vision Working Group and in the "near-term" updates existing specification Recommendations or develops new Recommendations as appropriate to support implementations of these concepts. Again, coordination with external organizations in this task will be required.

- **Satellite Coordination** (Dr. Pascal LE MENN, USA)
  - is responsible for acting as internal WP 8F co-ordinating function and focal point for satellite aspects;
  - is responsible for functioning as the WP 8F point of interface for draft liaison statements to WP8D on satellite issues;
  - is responsible for maintaining and updating ITU-R Recommendations related to IMT-2000 and systems beyond IMT-2000 in co-ordination with WP 8D;
  - is responsible for determining which WP8F documents are relevant to WP 8D.
WP8F Working Groups - Terms of Reference (3)

- **Spectrum Working Group** (Ms. Janette DOBSON, UK)
  - is responsible for spectrum matters related to IMT-2000 and systems beyond IMT-2000;
  - is responsible for considering IMT-2000 spectrum implementation issues and any necessary sharing, compatibility and interference criteria between IMT-2000 and other radio services;
  - is responsible for maintenance/update of existing IMT-2000 spectrum related Recommendations and reports, as appropriate;
  - is responsible for identifying areas where joint work and/or liaison is needed on spectrum matters with other relevant groups, as appropriate.
Conclusions
Conclusion

- There is no more “local only” marketplace - global focus is the driver.

- The world of international standards has permanently changed.

- Continued rapid changes in the communications marketplace and in technology dictates the need for a “new way of doing business” in standards development including a plethora of new specialized specifications development fora created by the communications industry.

- ITU-R has successfully developed and used a new model for standards development in this brave new world of dynamic changes in communications technologies, multiple international standards development organizations, and increased globalization.

- This model works for IMT development now and into the future.

- This model is applicable to other standards development outside the ITU-R.

- Efficient work management and coordination is the prime concern not organizational structure.