ITU/BDT Regional Seminar on Broadband Wireless Access for Rural and Remote Areas for Africa
Yaoundé (Cameroon), 18-21 September 2006

BWA Standards Developed by ETSI BRAN

Bernd Friedrichs – Ericsson (BRAN Chair)
Mariana Goldhamer – Alvarion (BRAN Vice-Chair)

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TAKING YOU FORWARD

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We're on your wavelength.

TC BRAN - Main Areas (1 of 3)
Interoperable Systems

- Interoperable systems for Broadband Wireless Access (BWA)
  - HiperAccess (for cellular and hotspot backhauling)
  - HiperMAN (fixed/nomadic wireless-DSL like system, also appropriate for rural and remote areas)
- Base specifications (PHY layer, DLC layer, management)
- Test specifications (radio and protocol conformance)
- International cooperation
  - Harmonization with IEEE 802.16
  - Co-operation with WiMAX Forum
- First publications in 2002 (HA) and 2004 (HM)

Definition of „Interoperability“: to ensure communication between devices (base stations, terminals) from different vendors

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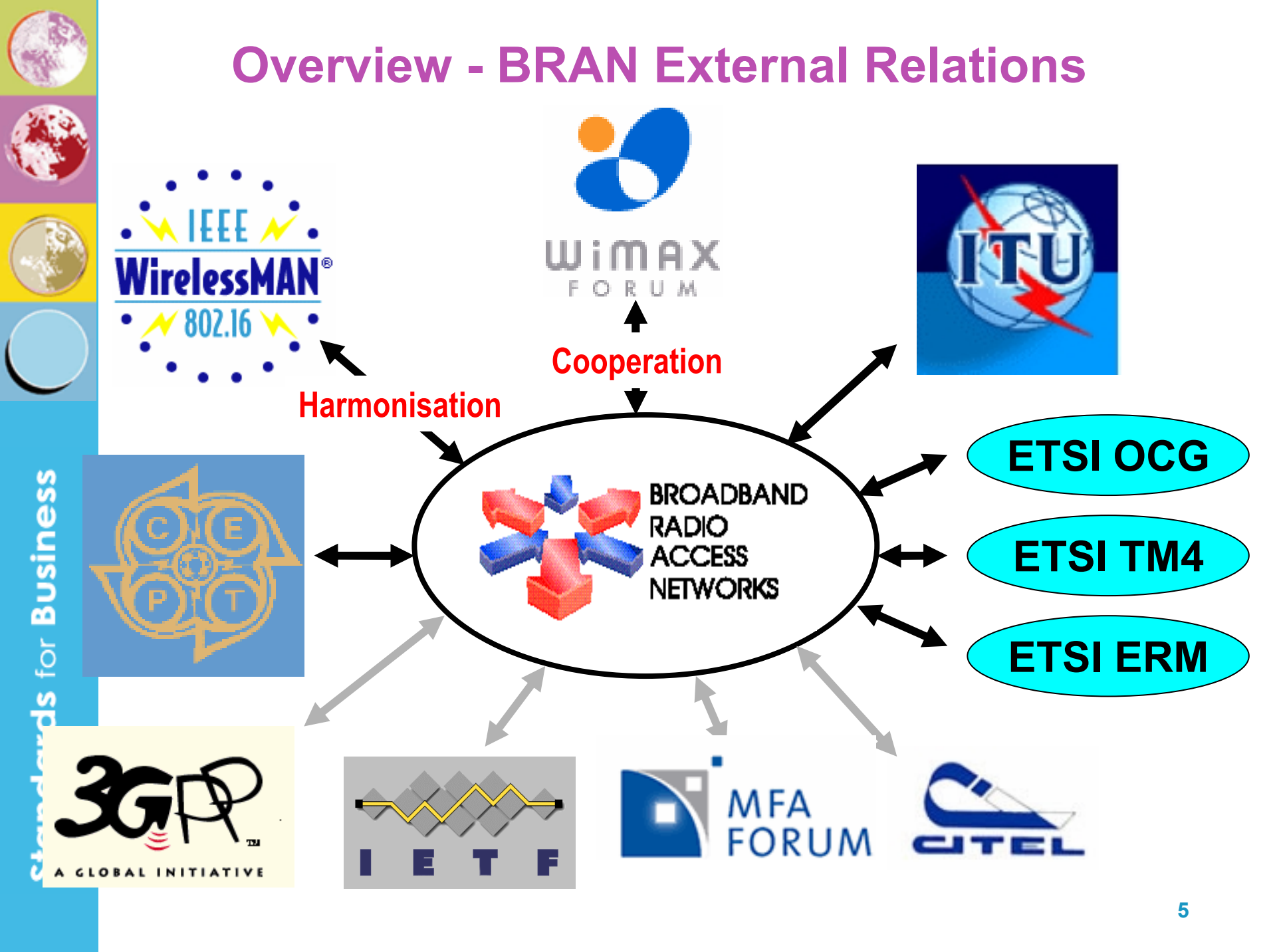
TC BRAN - Main Areas (2 of 3)
Regulatory Activities

- Regulatory competence working group (RCWG)
  - Established in 2004, as „horizontal“ group
  - Coordination of all spectrum related and regulatory issues
  - Assistance to regulatory bodies to define spectrum requirements and radio conformance specifications for new broadband radio networks
- Deliverables
  - Development of Harmonised Standards covering essential requirements under article 3.2 of the R&TTE directive (HEN)
  - System Reference Documents (SRDoc)

TC BRAN - Main Areas (3 of 3)
Testing

- Test specifications
  - Normative part of standard
  - Controlled in the open forum in the same way as base specs
  - Actual testing and certification is left to industry and their associations
- Test methods
  - Good results from using advanced spec methods and languages
- Testing organization
  - Work is progressed through STF (Special Task Force)
  - STF funded by ETSI, operating under the guidance of BRAN
  - Supported by ETSI PTCC
  - More than 80 docs were published in the last three years
- Cooperation with Industry Forums (WiMAX)
  - Development of protocol conformance test specs for HiperMAN, co-funded by WiMAX Forum

Overview - BRAN External Relations



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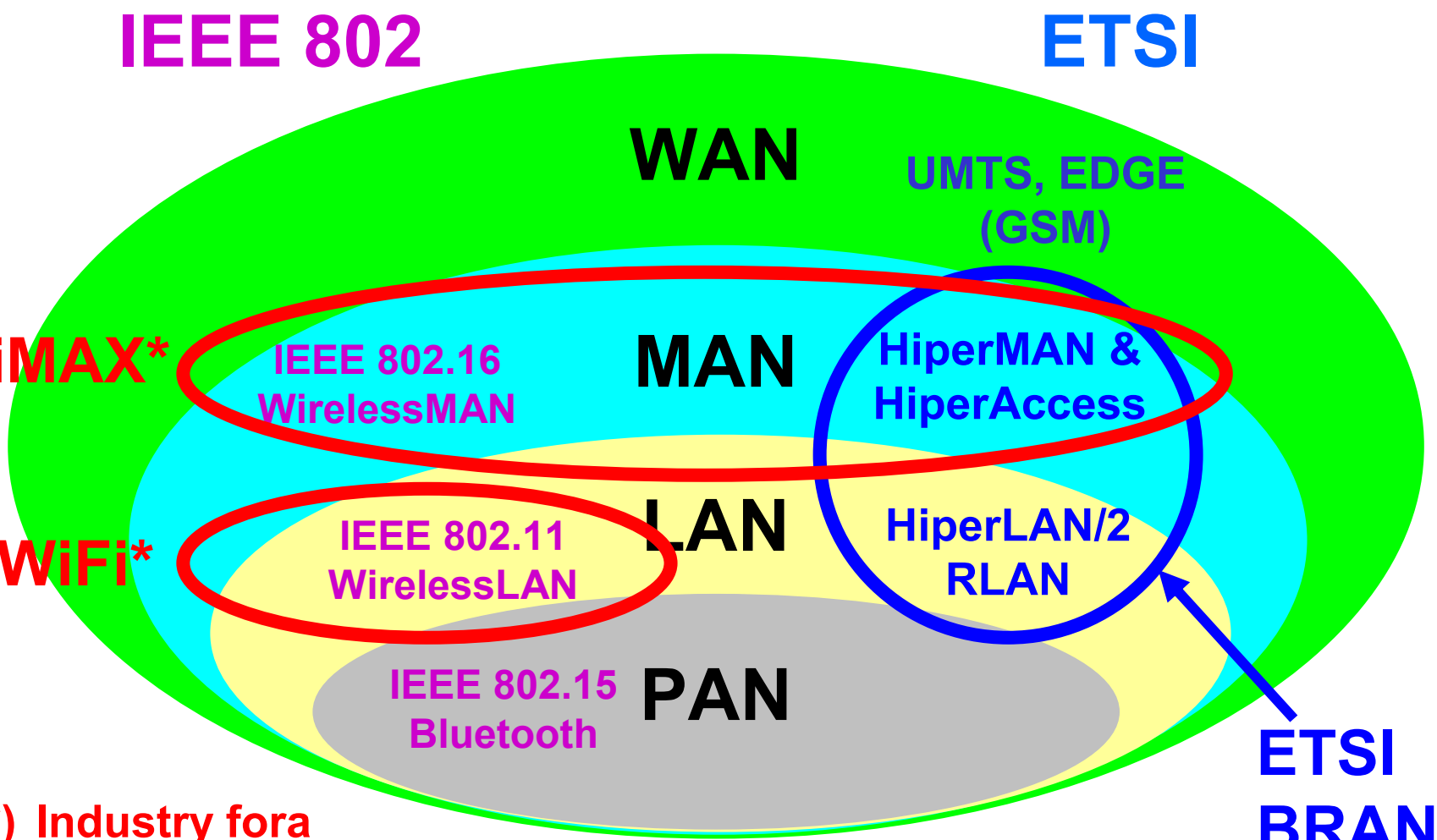
Overview - Global Wireless Standards



*) Industry fora
for promotion
and certification

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HiperAccess - Overview

- **Main applications**
  - UMTS backhauling
  - SOHO, SME
  - Typically too expensive for residential access / WLL / LMDS
- **Main technical features**
  - Optimized for ATM and Ethernet
  - Frequencies above 11 GHz, paired and unpaired bands
  - Based on single-carrier transmission
  - Data rates up to 120 Mbit/s
  - Range up to 12 km
- **Commercial roll-out**
  - HiperAccess-compliant products available since in 2005
  - High interest from numerous operators

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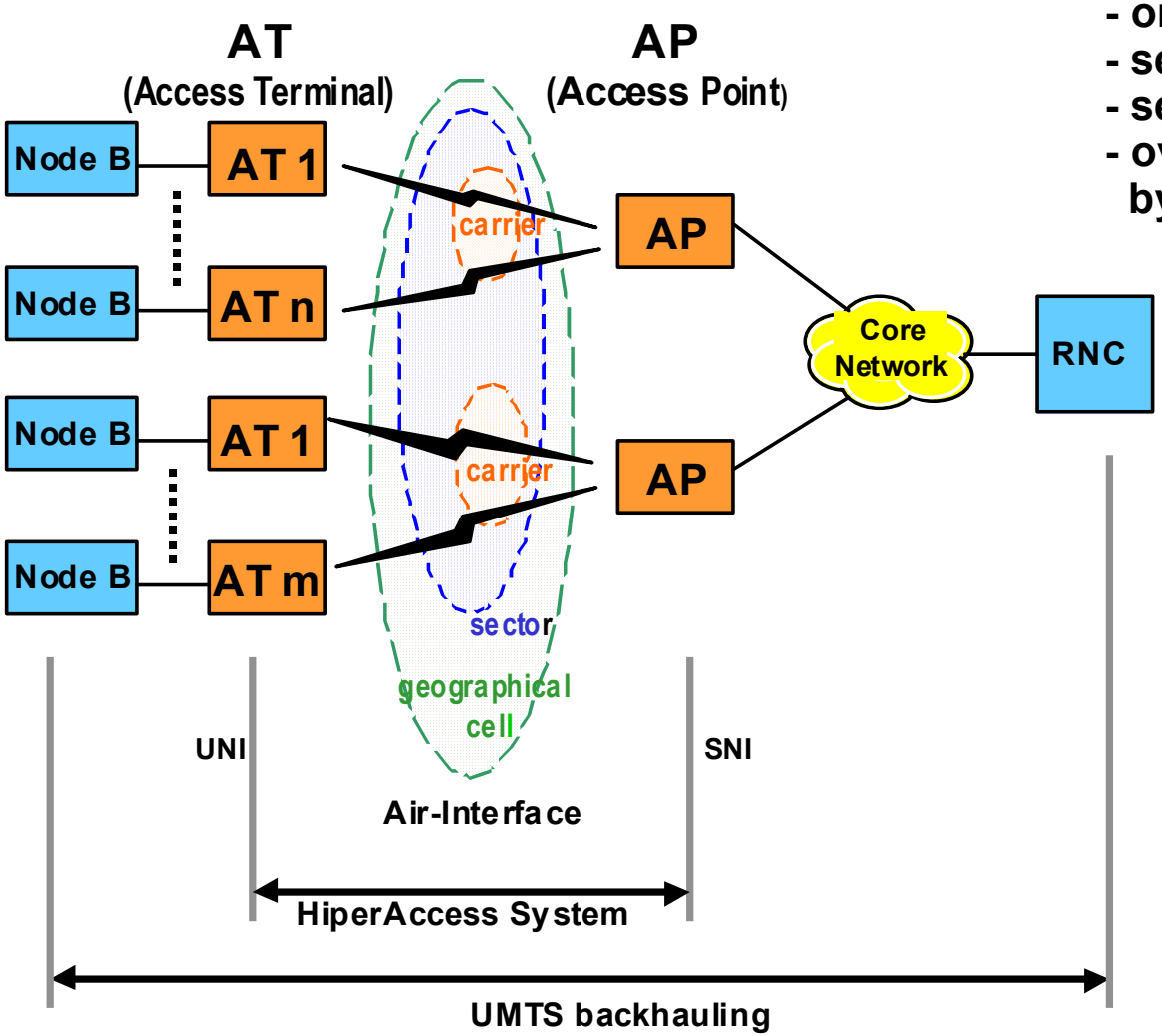
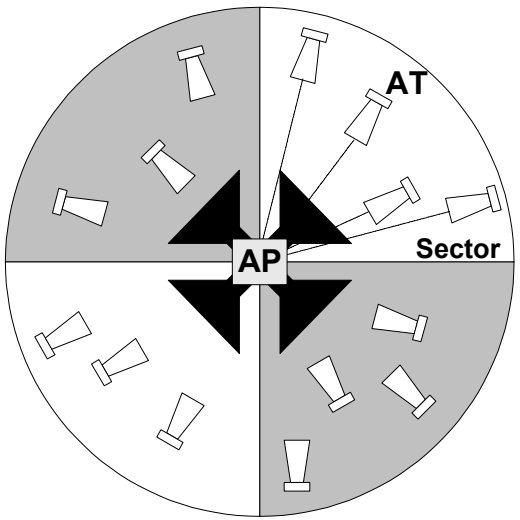
Ericsson's Minilink AXR (Access Radio) Product Line ... based on ETSI HiperAccess

- AXR enables operators to...
  - benefit from packet/cell-based radio system
  - support cellular backhauling networks (2G, 3G, WiFi, WiMAX,...)
  - support broadband applications for business customers
- AXR delivers distributed intelligence
  - Any radio access node supports broadband multiservice
  - Embedded switching and traffic shaping
  - Wide range of traffic interfaces
- AXR is topology-agnostic, supported topologies are...
  - Point-to-Point, Point-to-Multipoint, Mesh...
  - leading to capex and opex savings due to reduced product variety
- AXR key differentiator
  - Adaptive operation to changing propagation and traffic patterns for maximum transmission capacity in any situation
  - Link range can be optimized versus capacity
  - Support of ATM PNNI (facilitating E2E connection setup, dynamic routing, resilence in suitable networks)

Ericsson's Minilink AXR used for Cellular Backhauling

- one AP per carrier
- one AP per cell
- several sectors per cell
- several carriers per sector
- overlapping cells (separated by frequency or polarization)





Cell with four sectors

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HiperMAN (1 of 3)
Basic Features

- HiperMAN 1.2.1 - for fixed (FWA) use
- HiperMAN 1.3.2 - for Fixed / Nomadic (FWA/NWA) use
- PMP and Mesh architecture
- Optimized for...
  - frequency bands below 11 GHz without LOS
  - IP traffic
  - FDD and TDD
- Existing profiles: 1.75, 3.5, 7 and 10 MHz bandwidth
  - Can be extended up to 28MHz
- Fully harmonized with IEEE 802.16-2004 and 802.16e-2005, for OFDM/OFDMA PHY modes

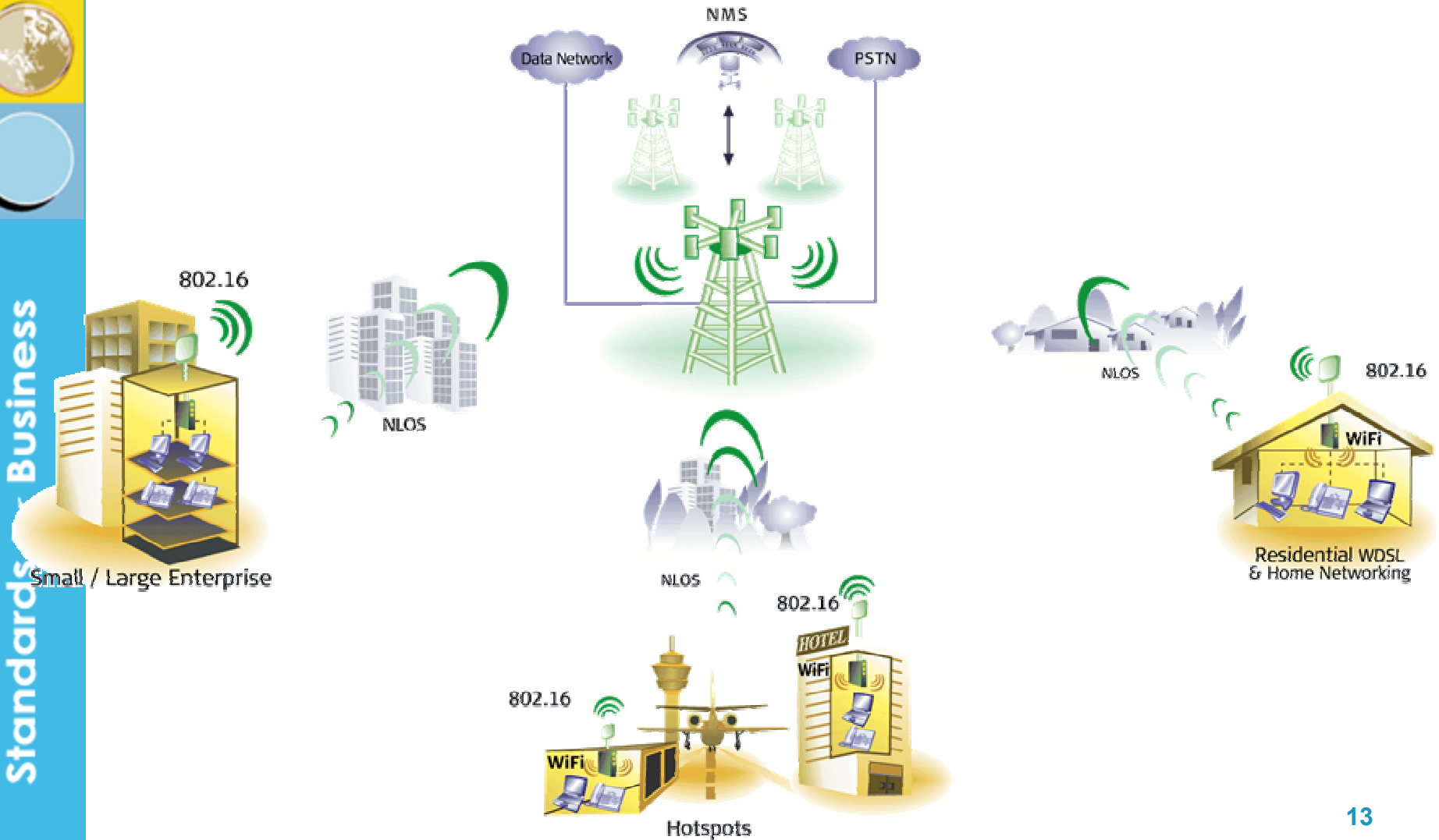
HiperMAN (2 of 3)
Advanced Features

- OFDM and SOFDMA PHY modes, for both Fixed/Nomadic applications
- Large cell size, suitable for Rural/Remote applications
  - Up to 50 km with directive antennas
  - Robust (against high multi-path and interference environments)
  - Support of advanced antenna systems (AAS)
  - Space-Time coding (2 diversity antennas on BS give 5-7dB)
  - Turbo-coding (2.5 dB more)
  - MIMO (4*4 quadruples efficiency, 2*2 is more economical and gives 7 bit/s/Hz)
  - Low power consumption (allows solar batteries)
- Adaptive modulation and coding (from QPSK to 64-QAM)
- Achieves 12...18 dB more system gain for same CPE TX power
- High security TEK encryption algorithms
- Load balancing between Base Stations

HiperMAN (3 of 3)
Technical Specifications

- Base standards (fixed/nomadic – v1.3.1)
  - ETSI TS 102 177 PHY layer
  - ETSI TS 102 178 DLC layer
- System Profile (v1.2.1 - 01.2005)
  - ETSI TS 102 210 System profiles
- DLC Conformance Testing (fixed) (v2.1.2–03.2006)
  - ETSI TS 102 385-1 PICS
  - ETSI TS 102 385-2 TSS&TP
  - ETSI TS 102 385-3 ATS
- DLC Conformance Testing (v1.3.1)
  - expected mid 2006, ATS architecture in Feb.06
- Management (v1.1.1 – 01.2005)
  - ETSI TS 102 389 MIB

Alvarion's BreezeMAX Product Line ... based on ETSI HiperMAN / IEEE 802.16



Standards Business

Alvarion's BreezeMAX

- Designed for WiMAX fixed, portable and mobile deployment scenarios
- Tested and approved by major operators all over the world
- Over 100 installations worldwide (commercial deployments and trials)
- Scalable, high capacity base station architecture
  - Macro and micro base station architectures
  - Advanced diversity and smart antenna techniques
- Rich CPE portfolio
  - Indoor self install and outdoor CPE options with embedded Intel PRO/Wireless 5116 (WiMAX chip)
  - Data, voice and WiFi network interface
- Excellent coverage
  - Proven NLOS performance using OFDM/OFDMA radio technology
  - Diversity and smart antenna techniques
- Flexible deployment configurations
  - Various operating frequencies (1.5 - 6GHz) and duplexing (FDD, TDD)
  - Adaptable channel bandwidth 1.75-14MHz
- All Applications, All Markets, Anywhere!
  - Residential & enterprises, high density and rural zones
  - Triple play: voice, data, video, QoS supporting simultaneous multiple applications
- Carrier-grade NMS

ETSI - WiMAX Cooperation Agreement

- Status
  - The initial version of the agreement was signed in April 2005
  - It contained the annex specifying the work planned for 2005
  - New amendment covering work agreed for 2006 was signed in February 2006
- ETSI and WiMAX confirmed their common interest
  - to perform and promote standardization towards a global market
- ETSI and WiMAX co-operate for
  - Testing and certification of HiperMAN
  - Standards development
  - Regulatory activities to provide the necessary spectrum
- WiMAX Forum
  - Set up the certification scheme to assure interoperability
  - Control all aspects of certification
- ETSI
  - Is further developing HiperMAN/WiMAX test specs (PICS, TSS&TP, ATS) that are being used for certification
  - Contributes to the validation effort together with test tool developers and certification laboratory

HiperMAN testing (1 of 3)
Achievements in 2005

- Growing understanding and collaborative spirit
- Mailing list with 160 members from ~100 companies
- The first release of jointly developed HiperMAN/WiMAX test specifications approved in October and published in December 2005
  - PICS – Protocol Implementation Conformance Statement
  - TSS&TP – Test Suite Structure and Test Purposes
  - ATS – Abstract Test Suite, including TTCN-3 code for test cases
- The tests (close to 60 test cases) are implemented and ready for use in the first wave of WiMAX certification

HiperMAN testing (2 of 3)
Plans and first results for 2006

- Plans
  - Two phases, covering HiperMAN/802.16 corrigenda and amendments
  - Close to 500 k€ devoted to test development in STF252, co-funding (50% ETSI, 50% WiMAX Forum)
  - Detailed planning available but also constantly evolving
- Certification start achieved
  - January 19th 2006 WiMAX Forum™ Announced First WiMAX Forum Certified™ Products
  - In the announcement Ron Resnick, president of the WiMAX Forum said: "The achievement of Certification is a result of the successful collaboration of our Certification Working Group, ETSI, Cetecom Spain and WiMAX system suppliers."
- Second release of HiperMAN/WiMAX test specs
  - approved in April 2006 and expecting publication
  - Start of WiMAX wave 2 certification expected during the spring 2006

HiperMAN testing (3 of 3)
Plans for 2007

- Further work on test specifications is expected and planned for 2007
- Detailed plans will be elaborated for discussion at BRAN meeting in July 2006
- During the summer, the plans will be further refined and submitted to the Boards of ETSI and WiMAX Forum for their approval
- Expecting that the plans will receive the required support, the update of the co-operation agreement will be prepared for signature towards the end of 2006

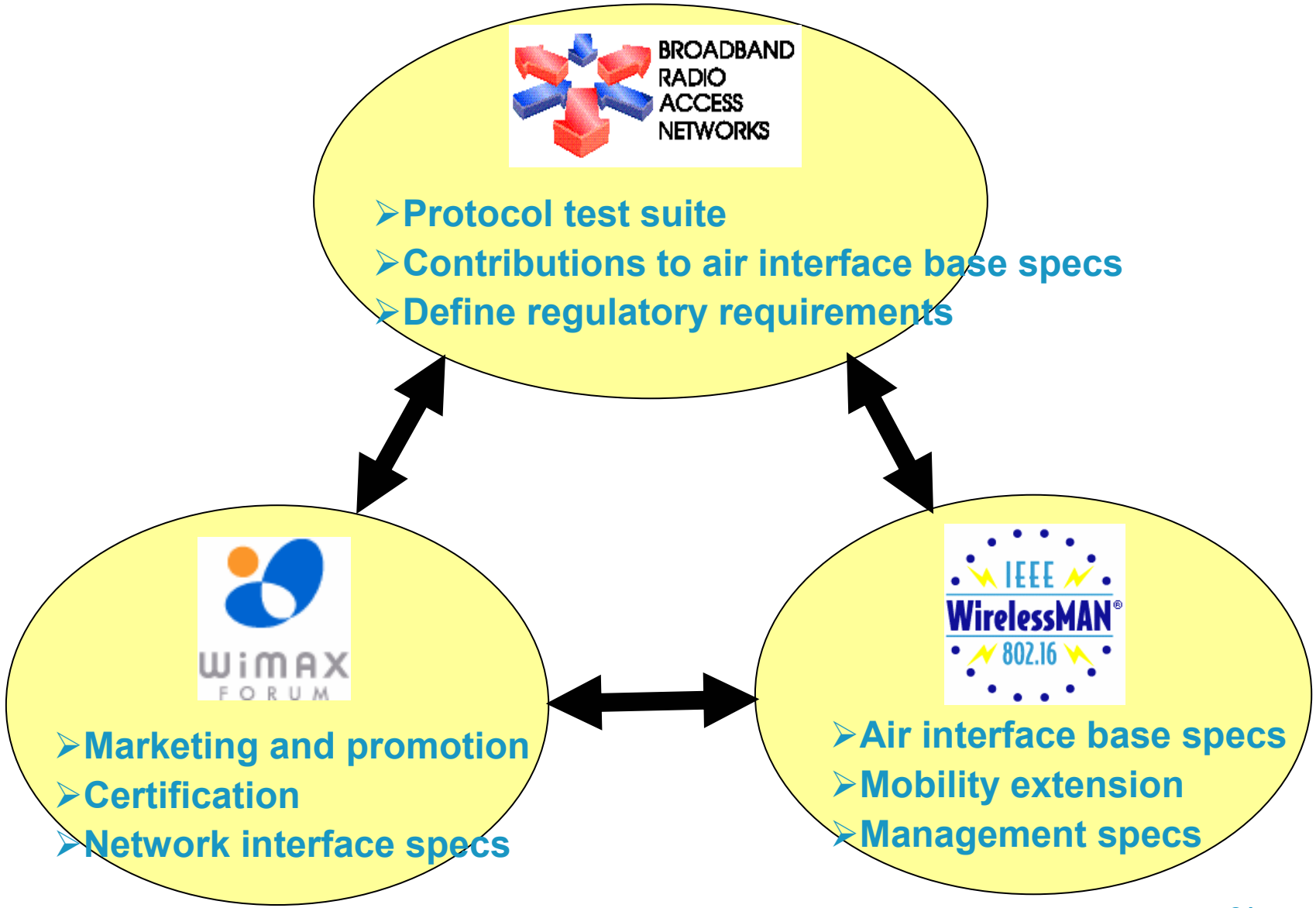
HiperAccess testing Achievements in 2005

- The Hiperaccess test specifications were updated and aligned with the latest changes in the Hiperaccess DLC and PHY standards
- A degree of test case validation was achieved
- Validation was done
  - Against the test tool simulating the opposite peer entity
  - Against the SDL model simulating the opposite peer entity
- The communication between peer entities was done using the UDP/IP transport
- This innovative method can be very useful in situations where real radio based test tools are not available

RCWG Overview

- 5 GHz Harmonized EN 301 893 (RLAN)
  - To be used for European type approval in < 5.725 GHz
  - Version 1.3.1 to be published in OJEC
  - Revisions for higher throughput technologies (MIMO, bonding)
- 5.8 GHz Harmonized EN 302 502 (FWA)
  - To be used for European type approval in 5.725 - 5.875 GHz
  - Currently resolution activities to resolve comments from PE
- 2.6 GHz Harmonized EN (Personal broadband systems - WiMAX)
  - Respecting ECC Dec(05)05
  - Coordination with ERM/MSG TFES (EN 301 908)
- SRDoc TR 102 453 (Converged Fixed-Nomadic BWA)
  - To be used by ECC for more spectrum allocation
  - Split in Part 1 (3.4 to 3.8 GHz) and Part 2 (< 3.4 GHz)
- SRdoc on Wireless Gigabit Systems @ 60 GHz

Summary of Main Competence
(ETSI BRAN, IEEE 802.16, WiMAX)



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Conclusions

- Wireless Broadband industry needs GLOBAL standards
  - Drive costs down!!!
- ETSI BRAN supports harmonization efforts with other parallel standardization bodies
- IEEE 802.16 - BRAN co-operation shows
  - What can be achieved
  - How standard bodies can contribute to each other
- WiMAX Forum - BRAN co-operation
  - Important signal to the market
  - ETSI benefits from WiMAX marketing and certification
  - WiMAX Forum benefits from ETSI experience and work approach

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Thank You!

- **Contacts:**
  - Bernd Friedrichs [Bernd.Friedrichs@ericsson.com]
  - Mariana Goldhamer [Mariana.Goldhamer@alvarion.com]