



Future Perspective of the WiMedia Standard

Holger Rosier
Comnets Research Group
RWTH Aachen University

- WiMedia's Vision and Standardisation
- Ultra Wideband (UWB) Regulation
- WiMedia Standard
 - Physical Layer
 - Medium Access Control Layer
- WiMedia today
- Summary

WiMedia's Vision in 2002

- Convergence of Portable Equipment (PE), Consumer Electronics (CE), Personal Computers (PCs) applications forces

Users to cope with

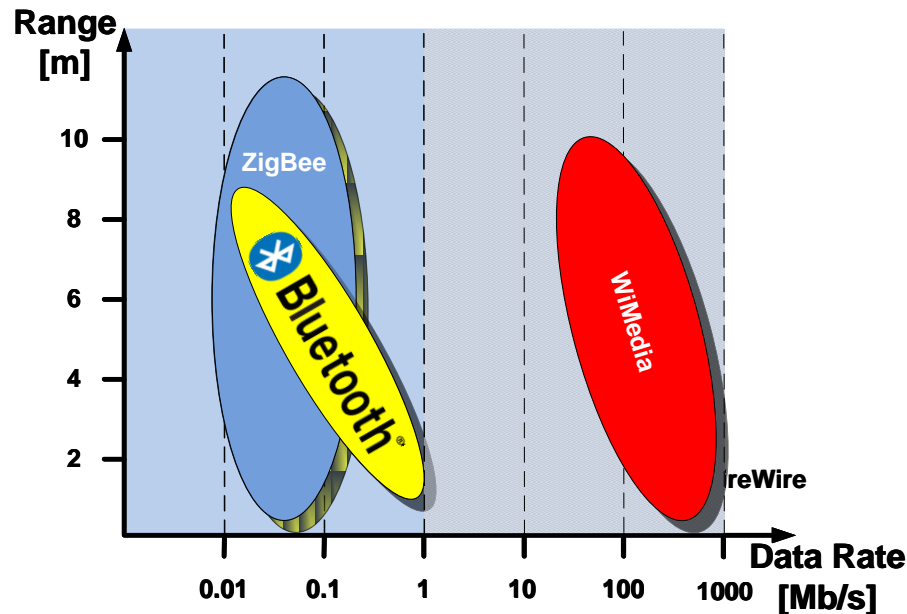
- low-rate wireless interfaces or
- high-rate wired interfaces

➡ Demanding usability, portability

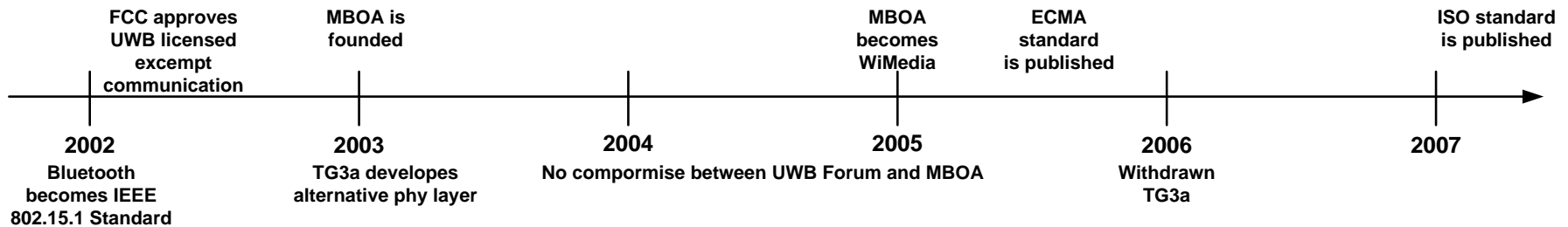
Industry to

- Unite different interfaces
- Develop high-rate wireless interfaces

➡ Using Common Radio Platform to close Wireless PAN gap



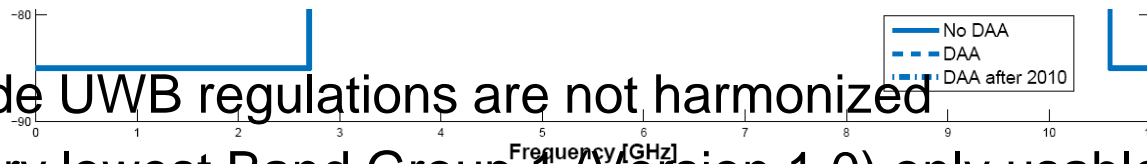
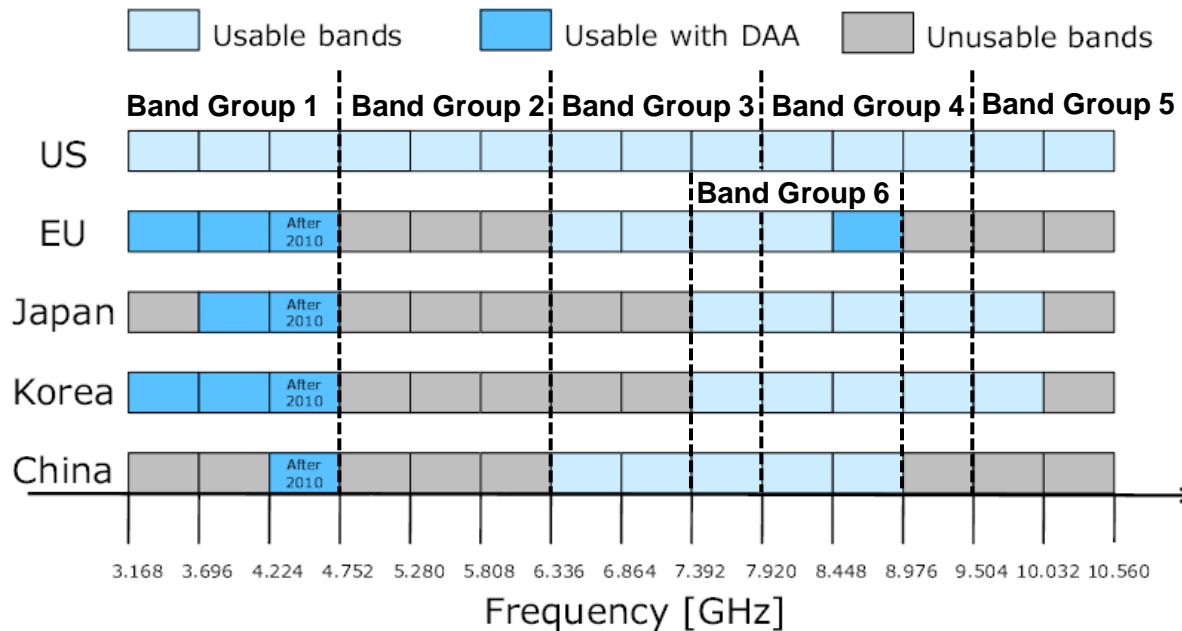
UWB Standardisation



- Beginning 2002: FCC allowed overlay UWB communication
- End 2002: High-rate WPAN activities, IEEE 802.15 TG3a was founded
- Until 2006: two competing industry alliances

<p>Multiband OFDM Alliance Multi-band OFDM supported by Intel, Nokia, Samsung, Philips</p>	<p>UWB Forum Direct-Sequence CDMA supported by Motorola, Freescale</p>
--	--
- 2005: WiMedia as promoter of MBOA's applications prepares ECMA publication
- End 2005: Commercial UWB standard published by ECMA (ECMA-368)
- Beginning 2006: IEEE 802.15 TG3a voted to withdrawn

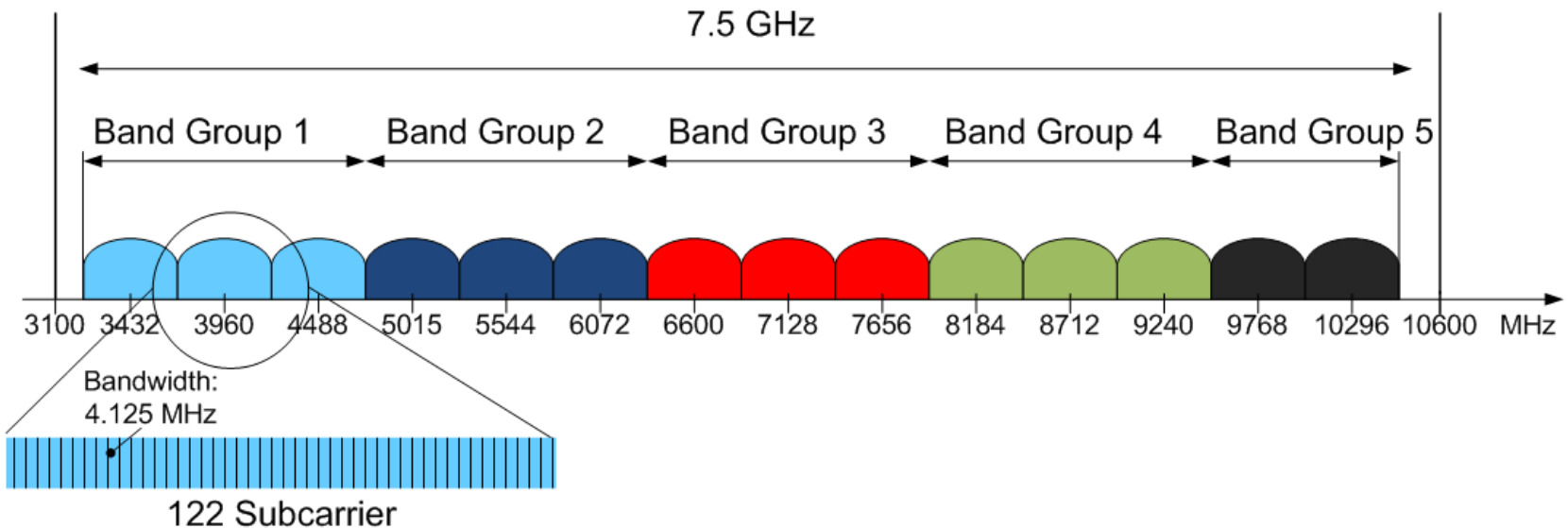
UWB Regulation



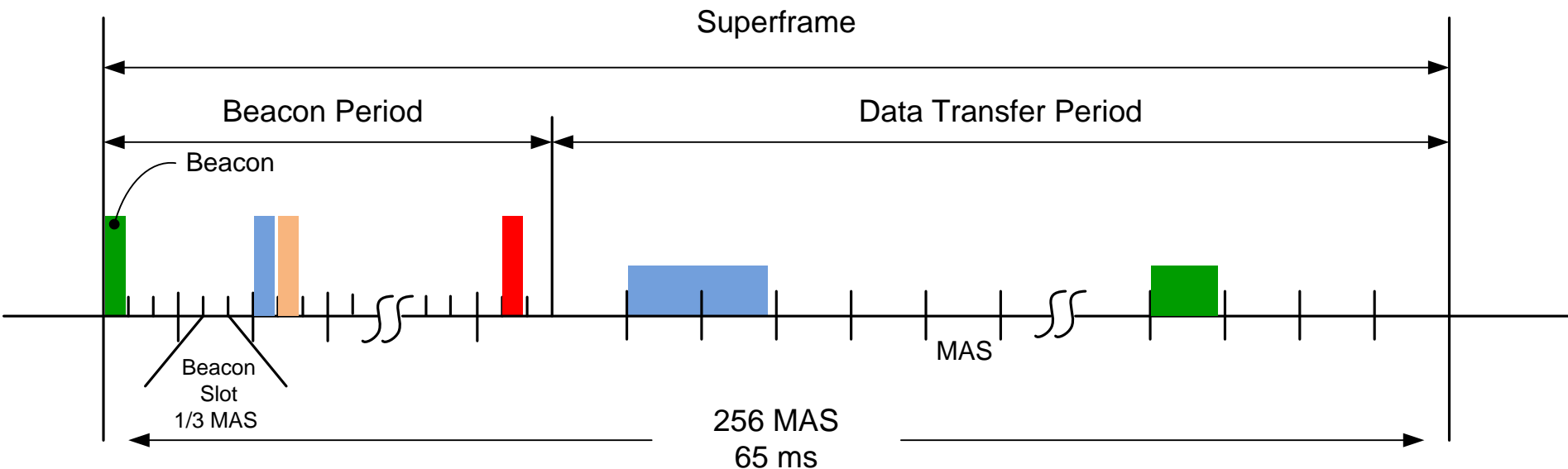
- Worldwide UWB regulations are not harmonized
- Mandatory lowest Band Group 1 (Version 1.0) only usable in US
- Coverage range decreases by high frequency dependant pathloss

WiMedia Physical Layer

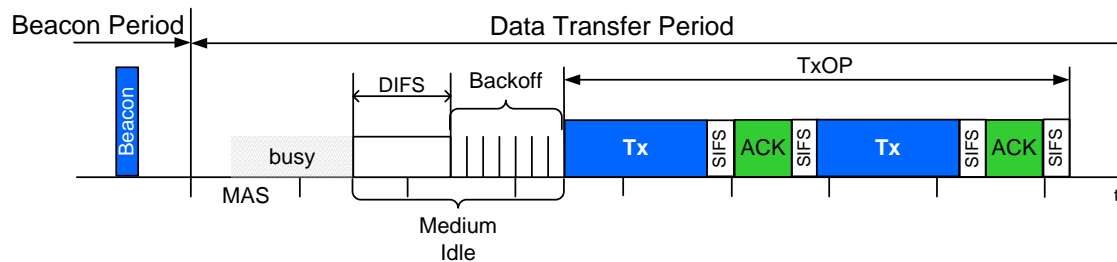
- Spectrum range 3.1 – 10.6 GHz, divided into
 - 14 frequency bands, bandwidth 528 MHz
 - 122 subcarriers per frequency band, bandwidth 4.125 MHz
- Maximal power: -41.3 dBm/MHz, coverage range \approx 10 m
- Data rates between 53.3 Mbit/s and 480 Mbit/s



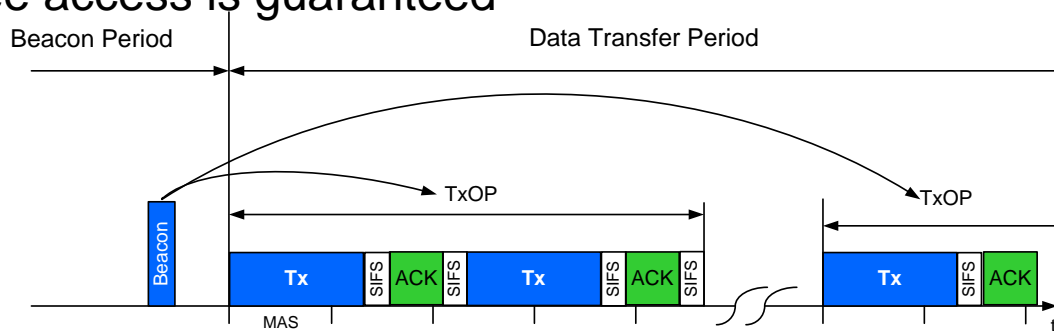
- Decentralised and distributed
- Periodically repeated superframe, duration: 65ms
 - 256 Medium Access Slots (MAS), duration: 256 μ s
 - Separation of user and management data
 - Beacon Period (BP): management information
 - Data Transfer Period (DTP): user data transmission



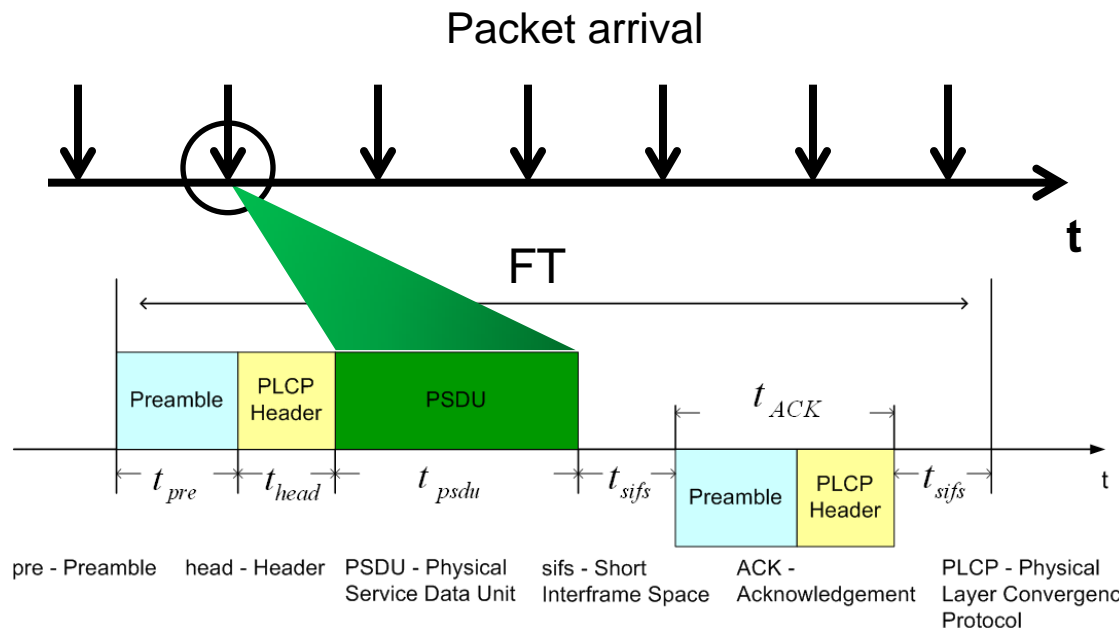
- Prioritized Contention Access (PCA)
 - Derived from IEEE 802.11e EDCA



- Distributed Reservation Protocol (DRP)
 - Negotiation for reservation
 - Reservation is announced in each beacon
 - Collision free access is guaranteed

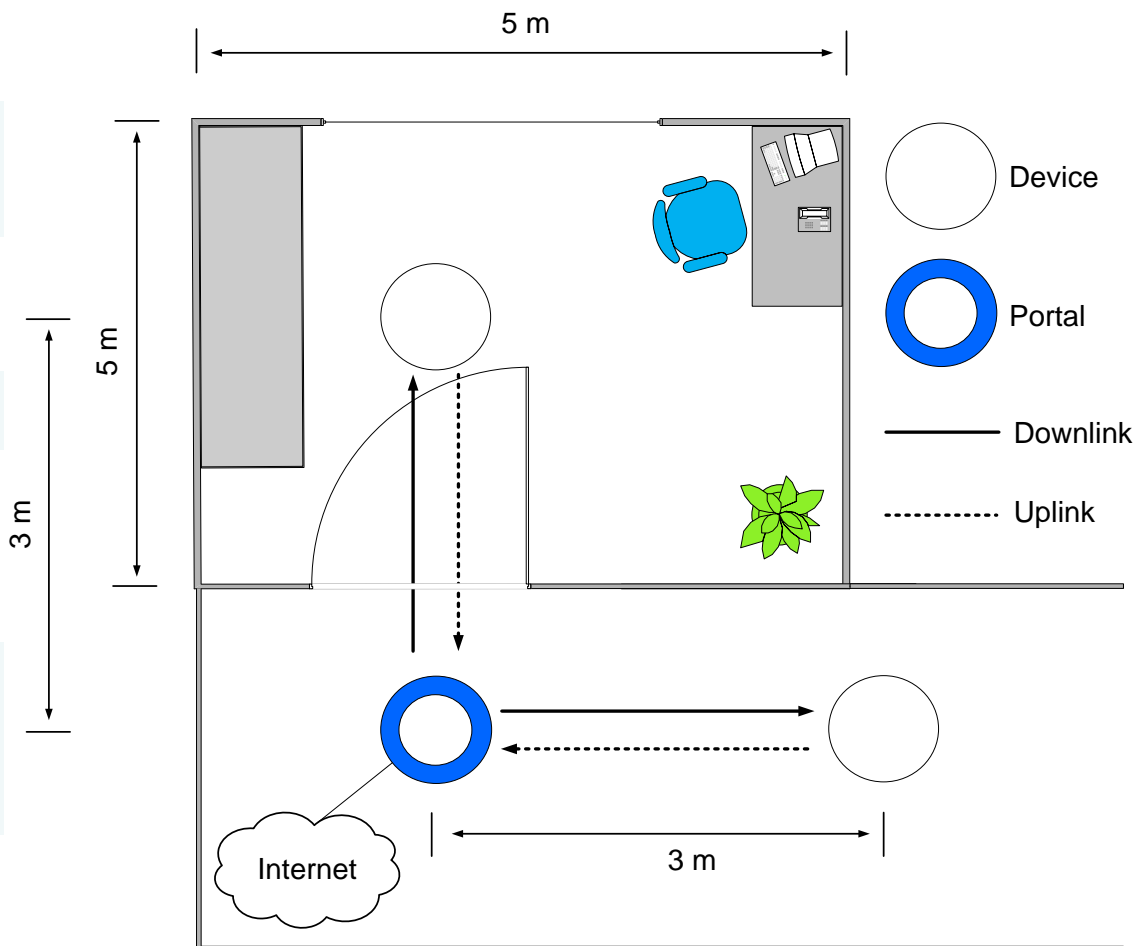


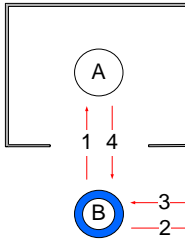
- Traffic Estimation
 - Number of packets per superframe
 - Packet size



Single Hop Scenario PCA versus DRP

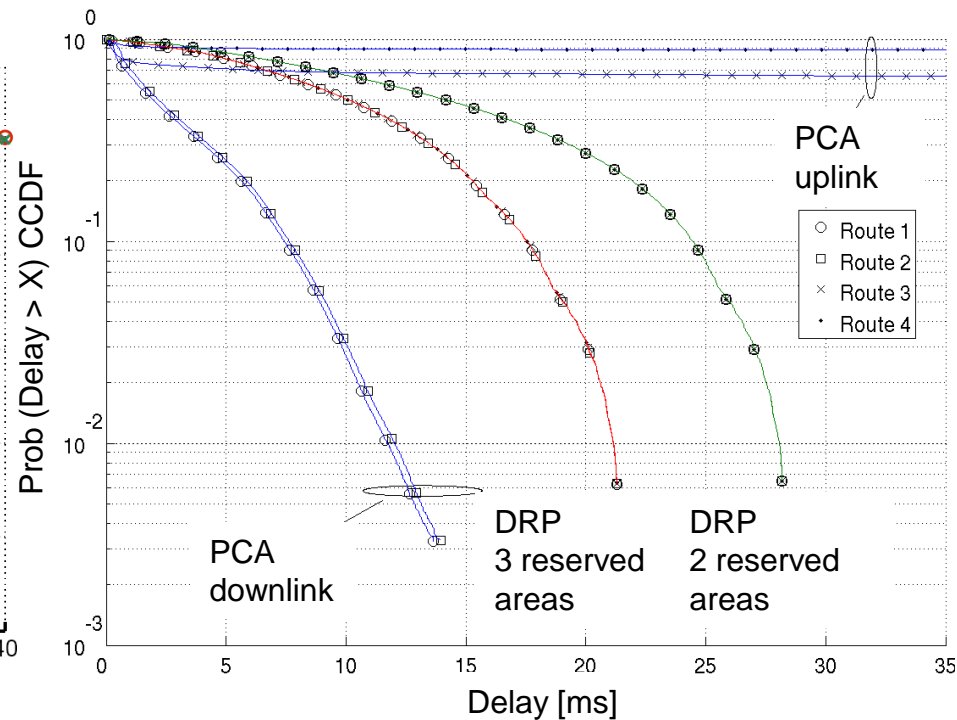
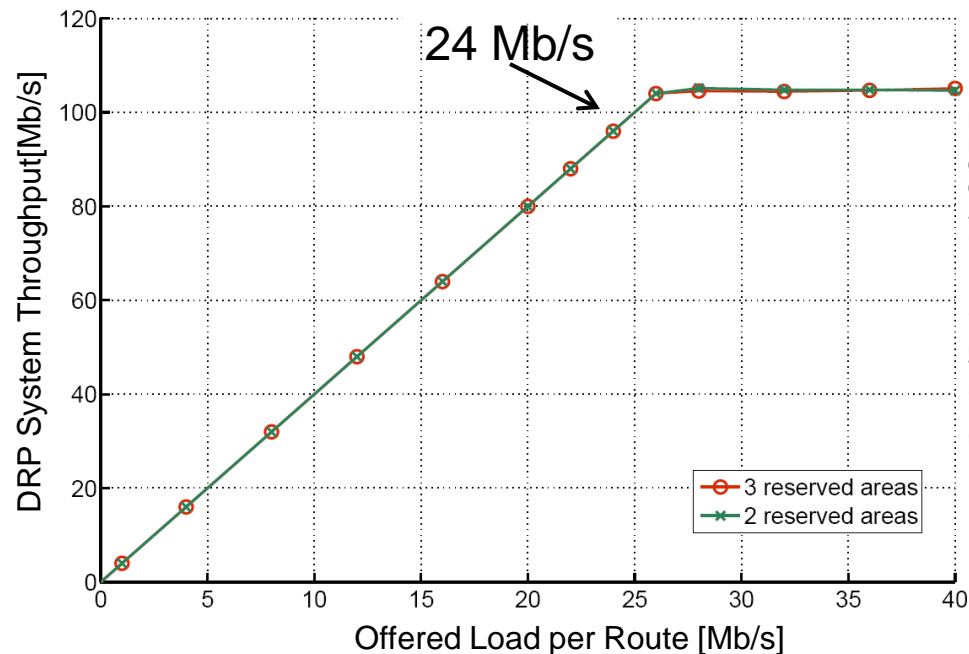
Frequency	3.8 GHz
Path Loss Exponent	2.9
Wall Attenuation	15 dB
MCS	200 Mb/s
Offered Load	Variable, symmetrically
Reserved Areas	2 & 3
Acknowledgment Strategy	Imm-Ack





Single Hop Scenario

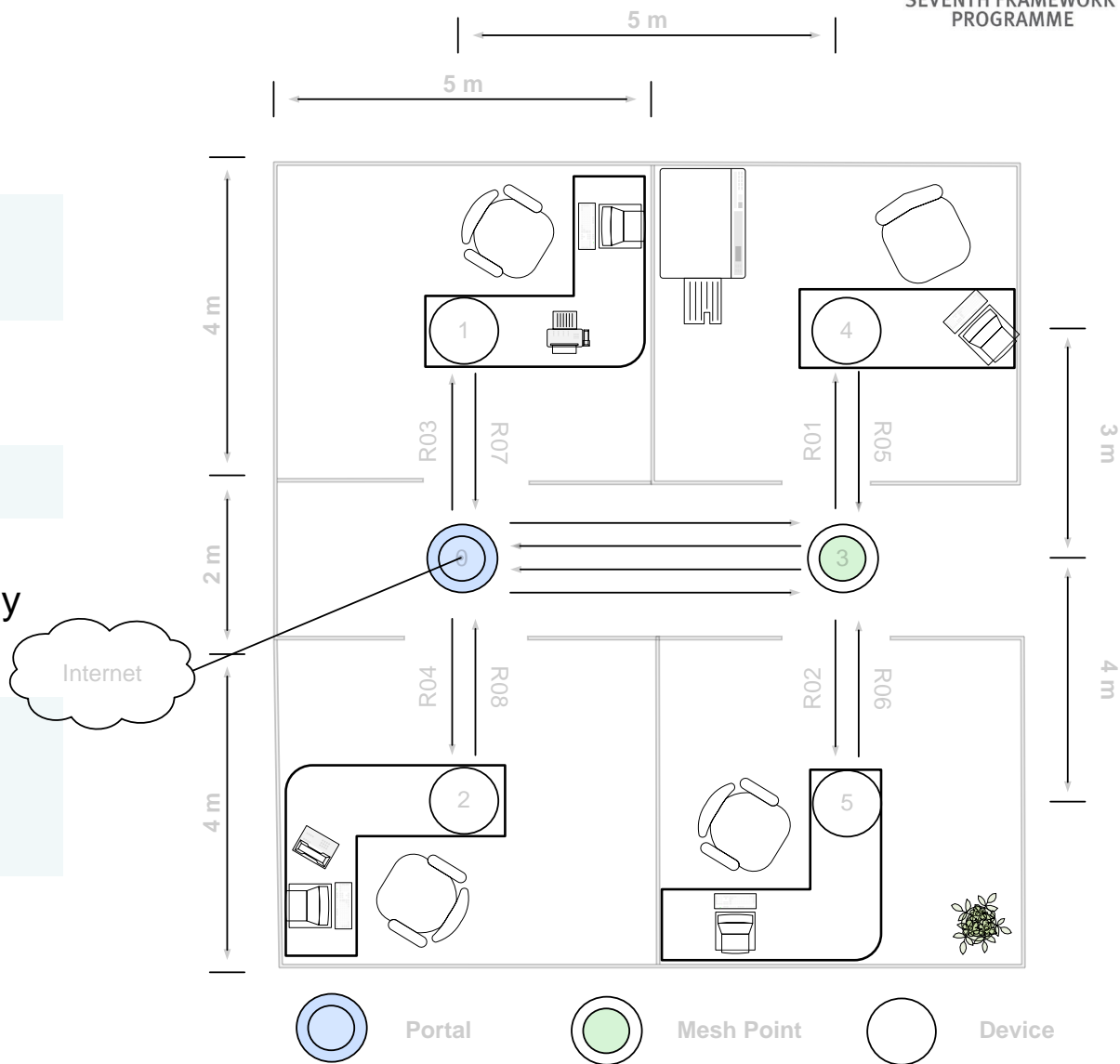
DRP Throughput and Delay



- PCA:
 - Uplink suffers from hidden node collisions
- DRP:
 - Device B acts as relay for management information
 - No frame collisions, device A and C respect each others channel reservation
 - Frame delay adjustable, becomes predictable

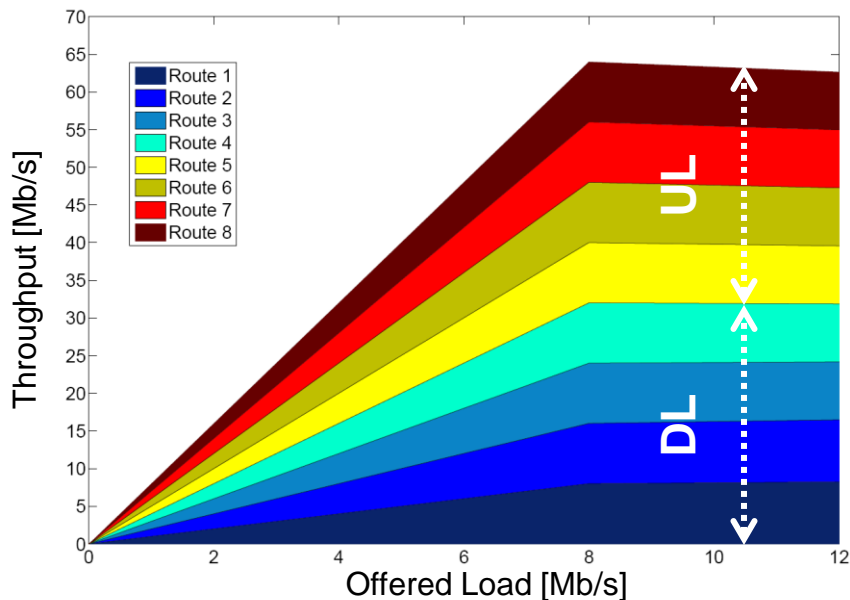
Multi Hop Scenario DRP versus PCA

Frequency	3.8 GHz
Path Loss Exponent	2.9
Wall Attenuation	15 dB
MCS	200 Mb/s
Offered Load	Variable, symmetrically
Reserved Areas	3
Acknowledgment Strategy	Imm-Ack

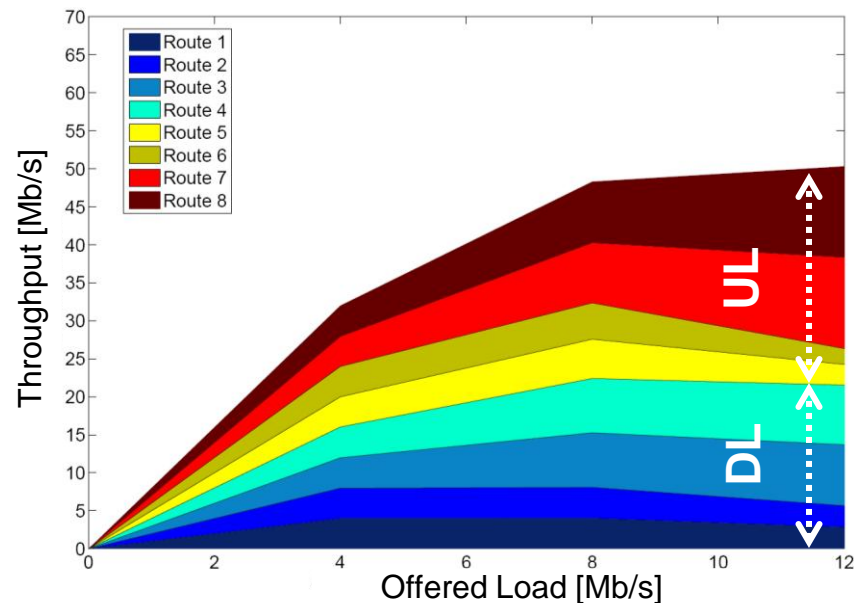


Multi Hop Scenario

Cumulative Throughput DRP & PCA



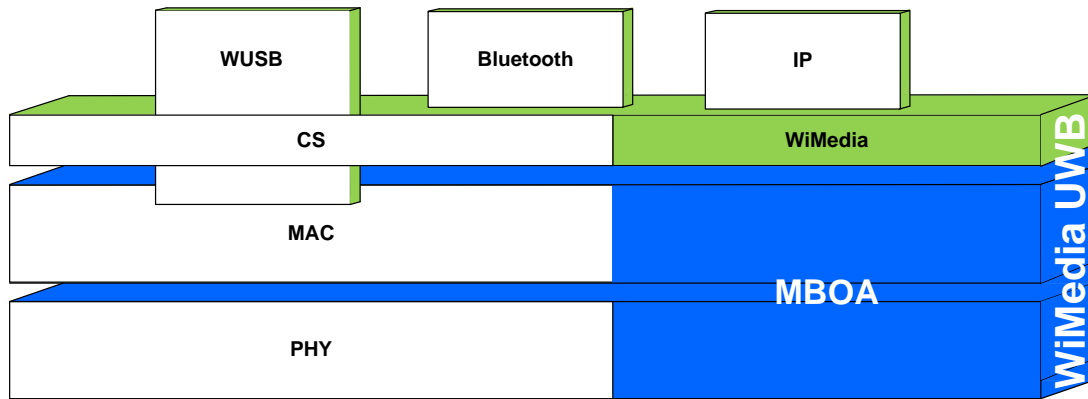
- DRP:
 - Throughput gain due to lower protocol overhead
 - Do not suffer from hidden node problematic



- PCA:
 - Two-hop routes for a lower offered load in saturation

WiMedia's Status Today

- Until 2009 WiMedia promoted Convergence Sublayer for transparent usage of Common Radio Platform (WiMedia UWB)



- Idea: capture PAN markets through wireless alternative solutions

- PE: USB → WUSB
- Bluetooth → Bluetooth over CS
- PC: USB → WUSB
- CE: HDMI → (WUSB)
- Firewire → WUSB
- Ethernet → IP over CS

- Solution based on UWB today

Available for

- Wireless USB
- Wireless VGA

Not available for

- Firewire, no further activities yet
- Bluetooth, SIG chooses IEEE 802.11g as alternative

- Mid 2009 WiMedia handed over and shuts down activities
- 2010 Version 1.5 is published

- UWB standardisation and regulation took long time
- Several promoters abandoned UWB
- Delay in market entry allowed revivals to enter WPAN markets
- Today's solutions for WPANs are confusing
 - IEEE 802.11
 - 60 GHz systems
- WiMedia well suited for WPAN applications
 - Fully distributed medium access emphasises ad-hoc characteristic
 - Prioritized Contention Access for flexible and scalable data transmission
 - Distributed Reservation Protocol for data transmission demanding high QoS
- WPAN gap for short range communication is not closed yet
 - Vision and assumptions made on WPANs are valid as much as the date of founding WiMedia in 2002



hor@comnets.rwth-aachen.de