

Summary and Future Prospects of MIMO

Juha Ylitalo & Markku Juntti

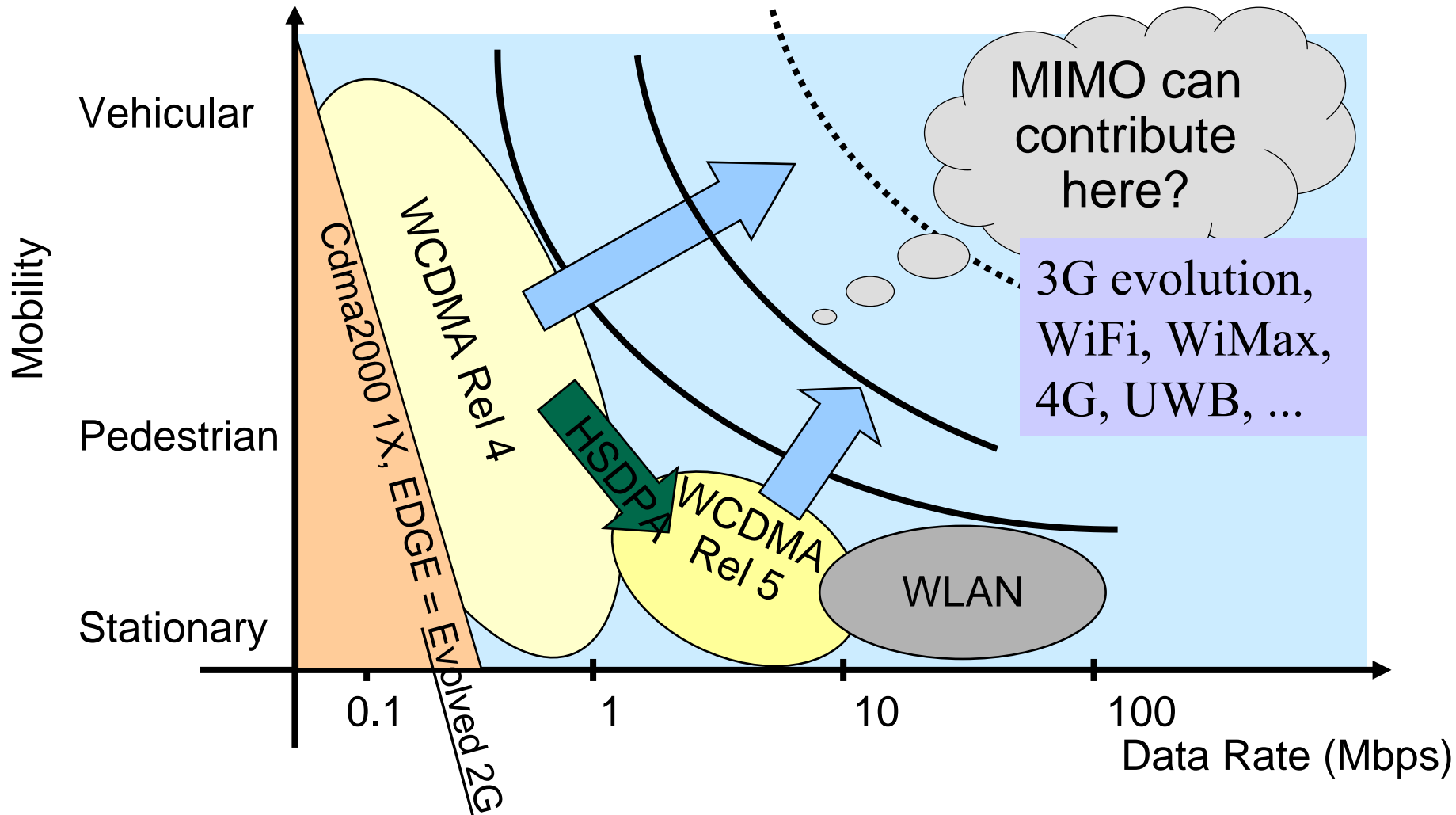
Contents

- Multi-antenna schemes
- Cellular System Evolution
- HSDPA with MIMO
- MIMO prospects

Multi-antenna schemes

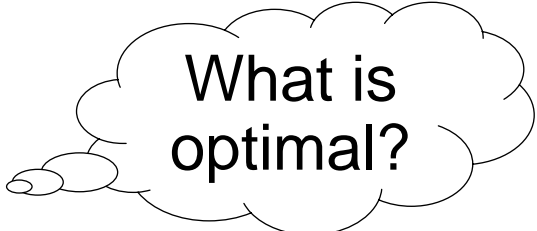
- The main possible multiantenna techniques:
 - Adaptive antennas and beamforming
 - space–division multiple–access
 - Spatial diversity
 - Spatial multiplexing
 - MIMO
- Potential for significant information theoretic capacity increase.

Scope: Cellular System Evolution



High-Speed Packet Access with MIMO

- Receiver feeds back the channel state information
- Adaptive modulation & coding schemes (MSC)
 - adaptive radio link using feedback information
- Hybrid ARQ --> operating point at 10%- 50% BLER
- Packet scheduler has a crucial role --> system level evaluation
 - multi-user diversity
 - intelligent transmit power management
 - multi-codes
- No soft handover probably applied (cell selection)
- HSDPA with MIMO scheduled for WCDMA rel. 6:
Target 10-20 Mbit/s
- HSUPA with MIMO still uncertain



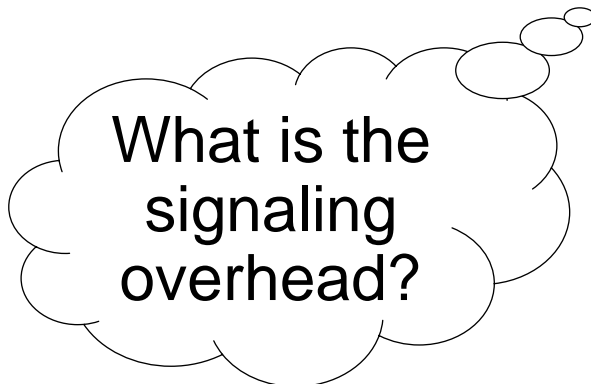
What is optimal?



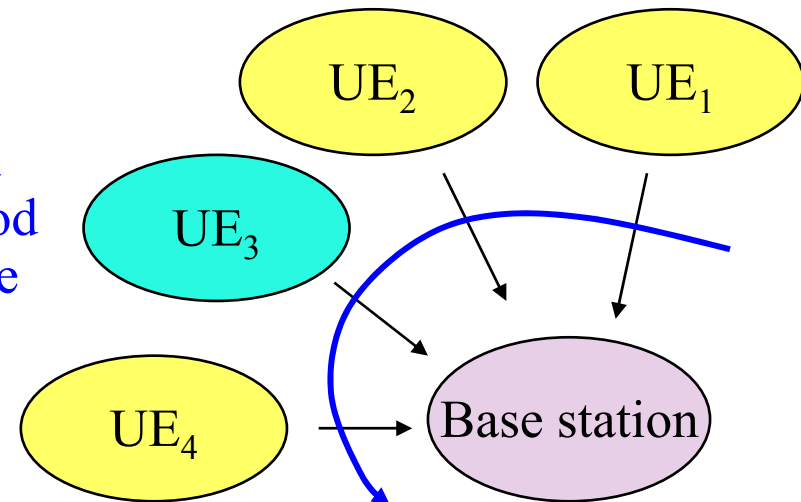
system level evaluation

MIMO Prospects

- MIMO has prospect in high data rate packet access
 - Scheduler ensures good channel
 - Multi-user diversity (fat pipe) gives trunking gain
 - Receive diversity is efficient
 - Due to HARQ operating point at 10% - 50% BLER
 - UEs with highest data rates close to BTS (high G-value)
- Improved system level throughput possible!



UE₃ served
due to its good
channel state



MIMO Tutorial

Thank You!