



Wireless Algorithmics at IMDEA Networks

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Suggestion, comments and texts by Domenico
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[Developing the
Science of Networks]

Transmission under Collision

- There are wireless systems in which in case of collision still one packet is received
- This contrasts with most theoretical models that assume collisions mean loss of packets
- Capture effect in 802.11: Signal strength and timing may make a packet to survive collisions

Arnbak. Capacity of slotted aloha in rayleigh fading channels. IEEE J. Select. Areas Commun., Feb. 1987.

Lee, Kim, Lee, Jo, Ryu, Kwon, Choi. An experimental study on the capture effect in 802.11 a networks, ACM international workshop on Wireless network testbeds, experimental evaluation and characterization, 2007

RTS/CTS

- Base Station (BS) and client stations
- Clients request transmission with short packets (RTS) and if granted (CTS) send the long packet
- Every station hears the CTS
- Takes care of hidden terminal, and reduces the probability and impact of collisions

Tinnirello, Ilenia and Choi, Sunghyun and Kim, Youngsoo. *Revisit of RTS/CTS exchange in high-speed IEEE 802.11 networks*, WoWMoM 2005

Perfect Clock Synchronization

- Advanced GPS technology allows synchronization to tens of nanoseconds
- This implements a global clock
- Global clocks can be used to coordinate events of the appropriate time granularity

Papadimitratos, La Fortelle, Evenssen, Brignolo, Cosenza. *Vehicular communication systems: Enabling technologies, applications, and future outlook on intelligent transportation*, IEEE Communications Magazine, vol 47, no 11, 2009

Directional connectivity

- Radio communication done with directional antennas
- Transmitter's beam is often narrower (a few degrees) than the useful angle at the receiver (up to 20 or 30 degrees)
- Possibility to have fast switching of antenna patterns using electronically steered antenna arrays
- A big challenge with this technology is to make it available for mobile nodes (e.g., by implementing fast tracking/looking algorithms to steer the antennae according to the user's mobility pattern).

Anticipatory Networks

- Anticipation is a promising new approach for designing networks
- Idea: predicting and adapting to upcoming events
- Driven by availability of “smart” handsets, and progress in machine learning and context-aware optimization

Other Topics of Interest

- Low speed communication (e.g. under water, sound-based)
- Visible light communication
- Super WI-FI: using space in the TV bands for wireless communication
 - Larger distances
 - Penetrates walls