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802.11b/g PHY models and validation

Workshop on ns-3
March 15, 2010
Gary Pei, Tom Henderson

Previous work: 802.11b clear-channel PHY validation

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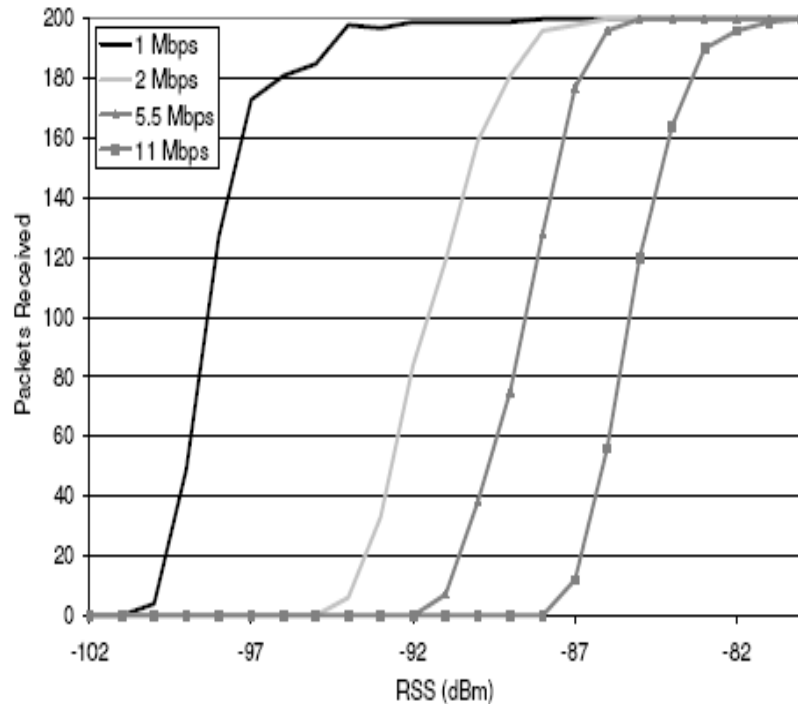
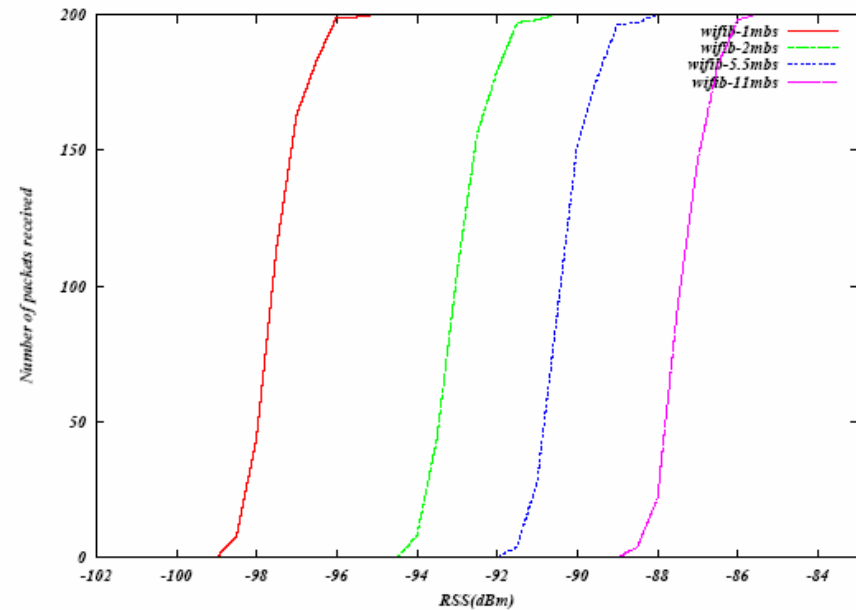


Figure 2: Clear Channel Reception

CMU emulator results from WINET paper
(Prism cards noise floor – 99 dBm)

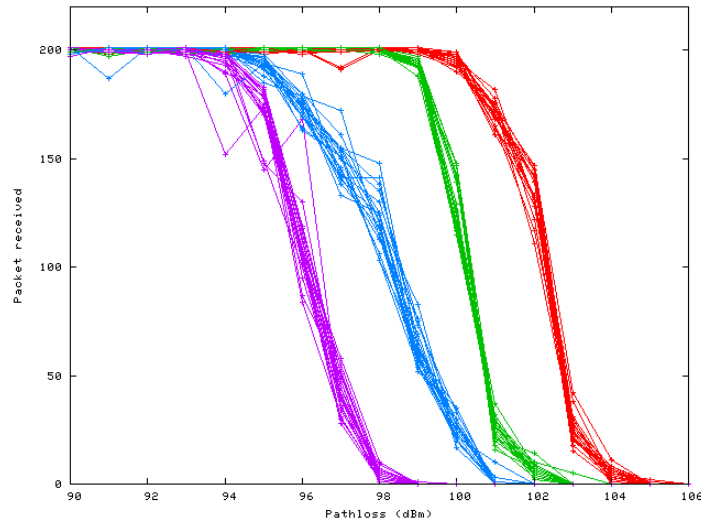


ns-3 results
(single run:
noise floor – 99 dBm)

Reference (unpublished work): <http://www.nsnam.org/~pei/80211b.pdf>

Other emulator data (802.11b)

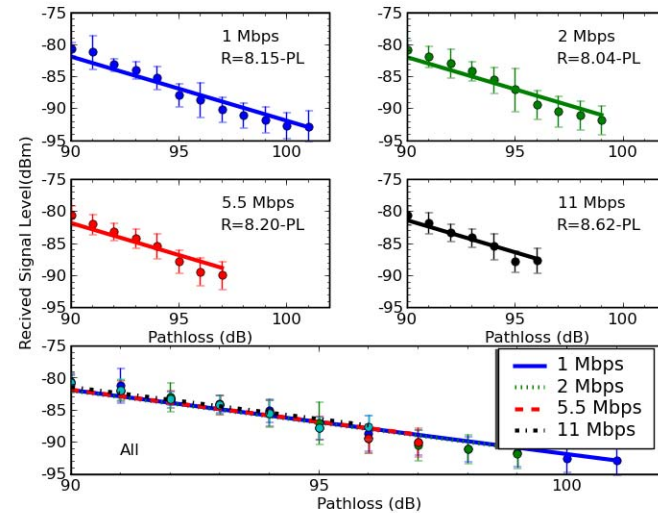
Raw data of 20 runs



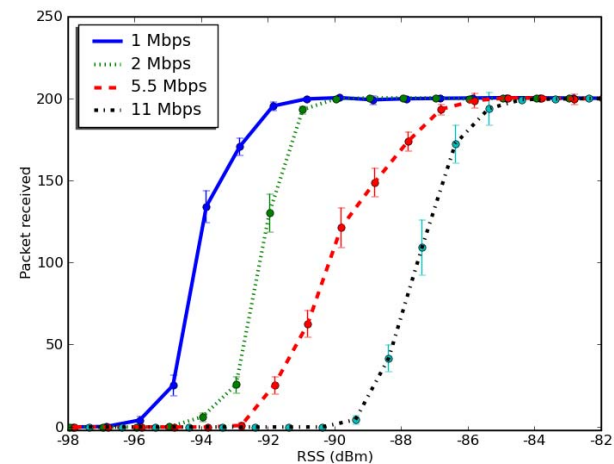
Atheros cards, noise floor -98 dBm
Node 111 and 112, August 2009

Pathloss estimate based on least squares fit on reported RSSI values from radiotap header and assumed known fixed transmit power

RSS vs. Path loss

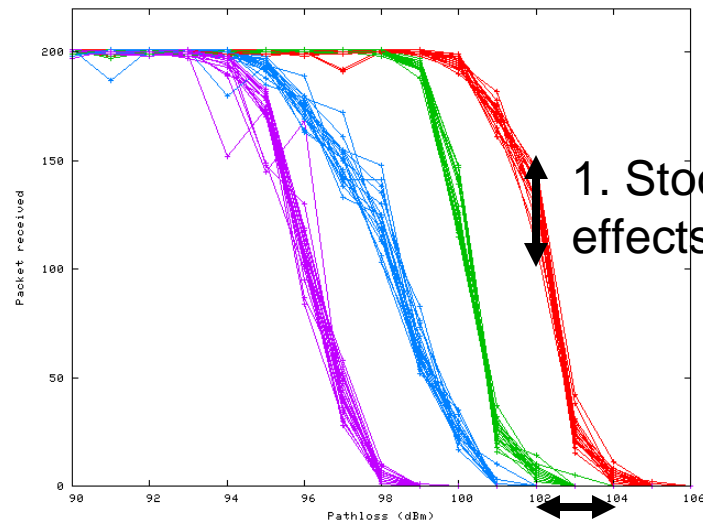


RSS vs. Path loss



Issues to model?

Raw data of 20 runs



1. Stochastic effects

We need to validate that randomness in observed repeated runs matches those of repeated ns-3 runs with different RNG seeds

2. RSS or pathloss measurement uncertainty

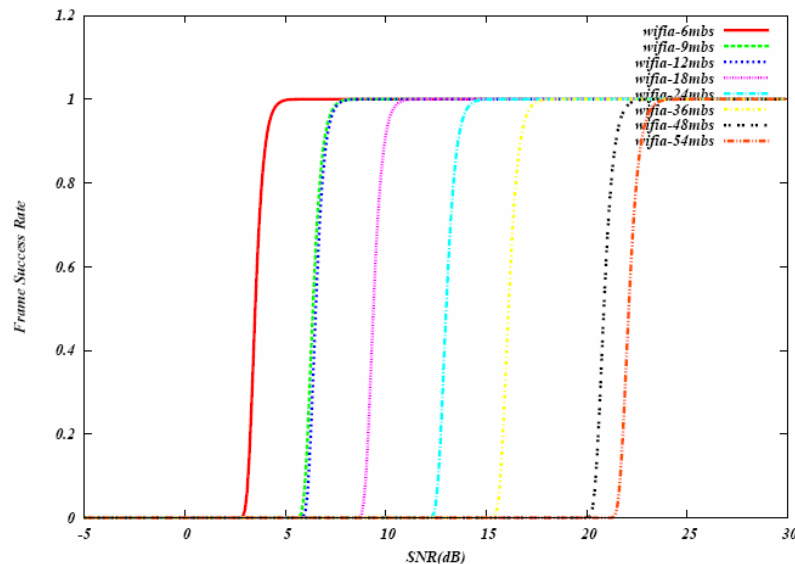
It seems that many users are not so concerned about absolute values here but instead the relative shapes of curves

- 3. Variability across cards (same implementation)
- 4. Variability across implementations

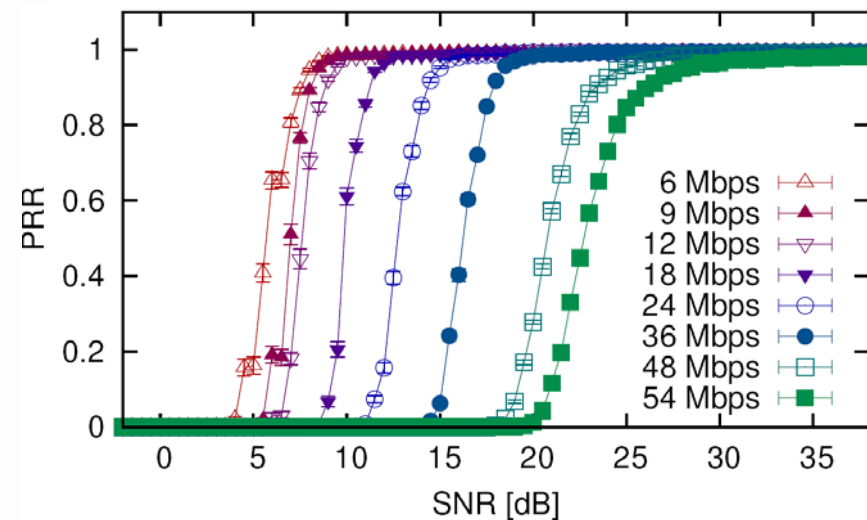
We do not have a large dataset for this, but anecdotally observed

802.11g results (clear channel only)

- **New OFDM BER models prepared for ns-3**
 - <http://www.nsnam.org/~pei/80211ofdm.pdf>
- **Validated against KIT data***
 - **caveat: haven't been able to reproduce yet**



new NIST OFDM model



CMU emulator data from Patrick Armbruster (KIT)

* Papanastasiou, Stylianos, Mittag, Jens, Ström, Erik G, Hartenstein, Hannes - "Bridging the Gap Between Physical Layer Emulation and Network Simulation," Proceedings of IEEE WCNC Conference, 2010, April, 2010

Future work planned for 2010

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- **Validate/publish 802.11b/g clear channel models**
- **Adjacent channel interference models (G. Pei)**
 - **Coordinate with Nicola Baldo's spectrum modeling work**
- **Co-channel 802.11b interference models (T. Bosaw and S. Roy, University of Washington)**
- **Bluetooth signals into 802.11b (C. Ghosh, T. Bosaw, and S. Roy, University of Washington)**