



Research at KAU in Bandwidth Estimation for Wireless (Mesh) Networks

COST-TMA Meeting

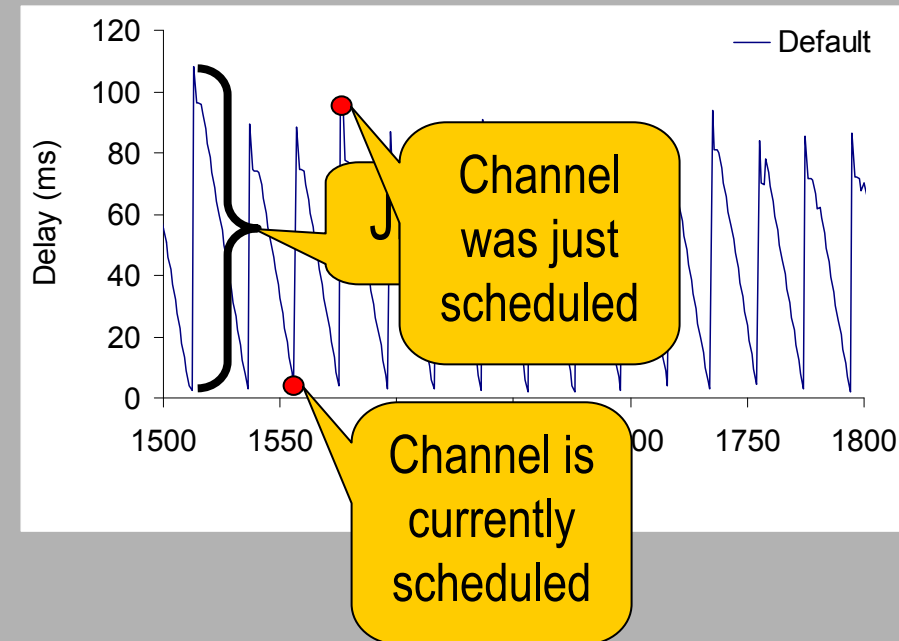
Barcelona,

October



Motivation

- Wireless Mesh networks
 - cost-effective, easy and quickly deployable wireless multihop backhaul networks
 - Multi-hop nature makes it difficult to estimate available bandwidth
 - Multi-Radio MultiChannel using channel switching have specific delay/jitter characteristics





Overview on Bandwidth estimation

- **Model Based Approaches**
 - E.g. Based on Bianchis model for WLAN
 - Model might be complex, difficult for multihop
 - Theoretical bounds
- **Active Measurement based approaches**
 - Using probes and packet trains to estimate
 - Overhead
 - Do not work well in wireless (multihop) environment unless improved otherwise
- **Passive Monitoring**
 - Listen to medium and try to infer
 - Just for one link/channel





Ongoing Work

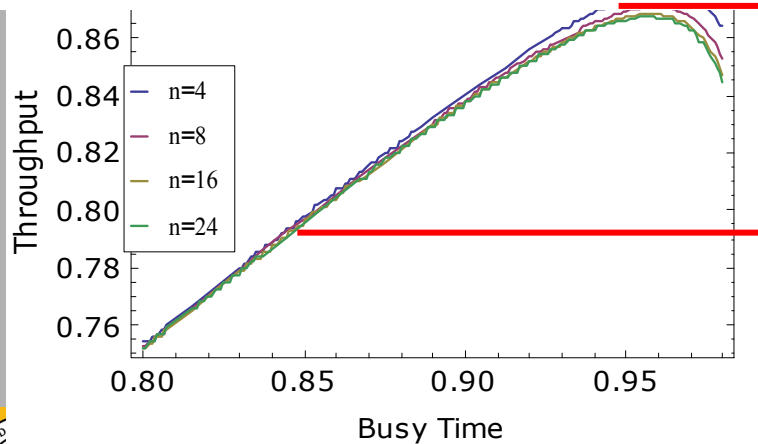
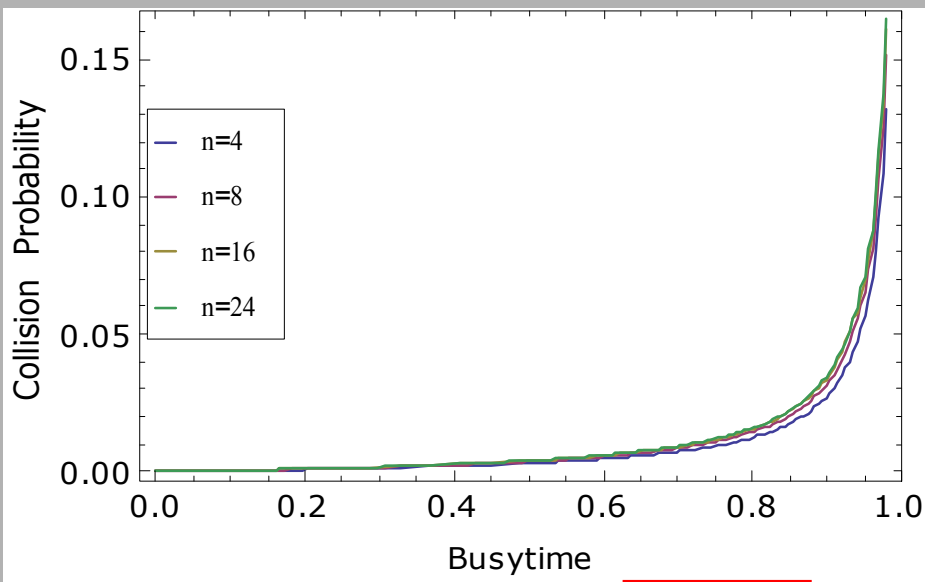
- Goal: Develop tool to estimate available bandwidth for a given link and channel → path
 - Can use for many purposes: Channel assignment (STSM with UNINA), Admission control, routing, etc
- Combine Model based approach with passive monitoring and better estimation
 - Use model (Bianchi, Garretto,...) to infer ...
 - Get input to model from passive monitoring and other sources (e.g. Information from routing based on ETX)
 - Improve the prediction using
 - Evaluate in KAUMesh and compare with other tools such as Pathchirp, spruce,...
 - Need to have tools for comparison (partners?)





Analytical Results

Estimating Available Bandwidth



Loss in throughput for n=4 approx. 7%

- Up to 85% busy time there are almost no collisions
- Maximum throughput and busy time are slightly dependent on number of neighbors
- Assumption
 - Busytime is always kept below 85%
- Consequence
 - From 0 – 85% the throughput scales almost linearly with busy time
 - Easy to estimate available bandwidth = $BW(85\%-busy)/T_{suc}$
 - By underutilizing the medium we don't lose much throughput



What about multihop and Hidden Nodes?



Q&A

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Can make available KAUMesh
to test available BWEstimation
Tools remotely

