



Radio Resource Assignment in Infrastructure Relay Networks

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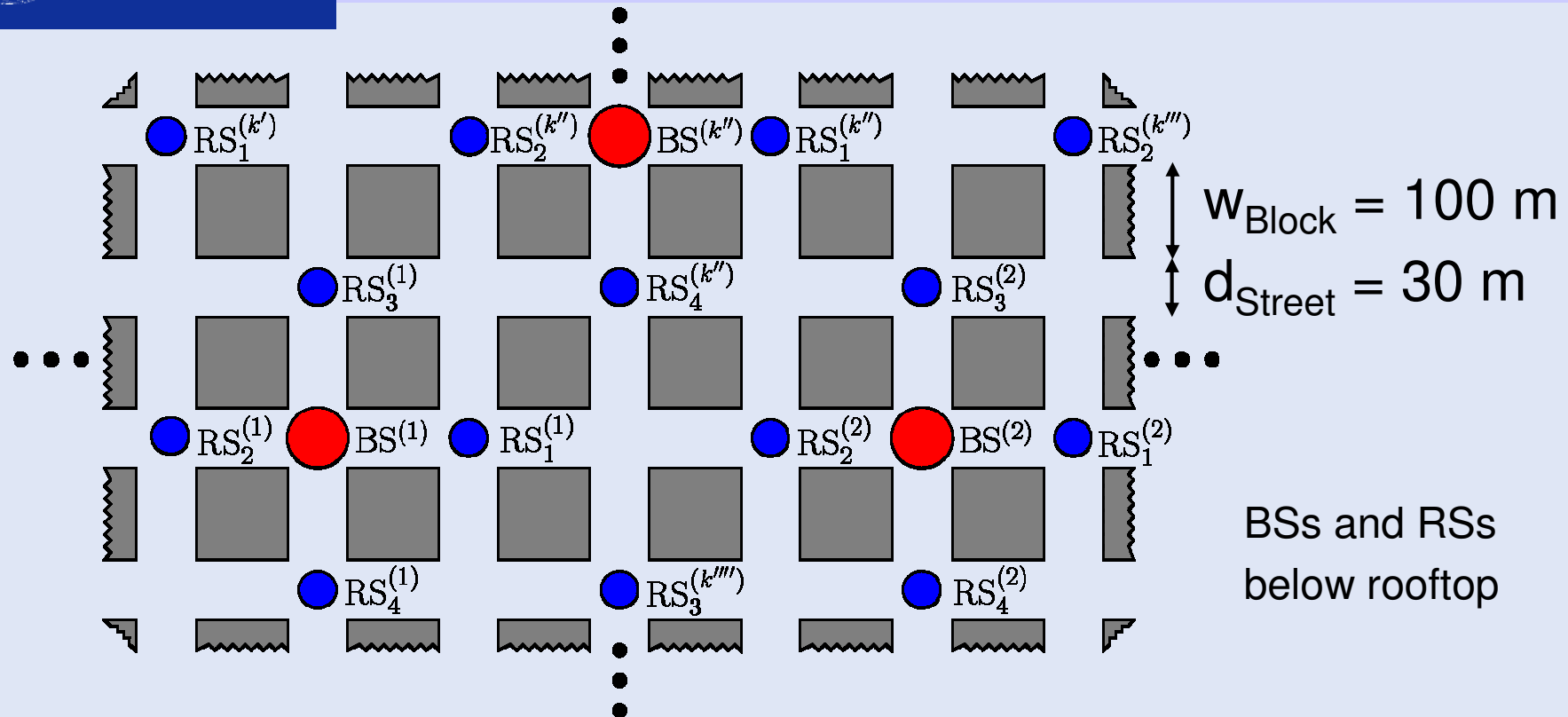
- Motivation
- Manhattan Multi-Cell Scenario
- TDMA Frame Structures
- Simulations
- Conclusion



Amplify-and-Forward (AF) Relay Networks



- range extension
- reduced power consumption
- high data rate coverage
- low complexity protocol



How to assign channel resources?

- two orthogonal resources of equal size for AF relaying
- reduce interference by considering topology
- efficient resource utilization

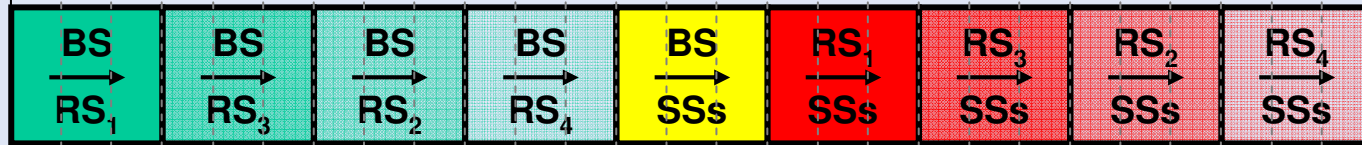


TDMA Frame Structures (1)

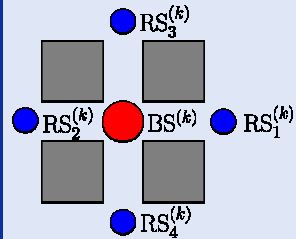
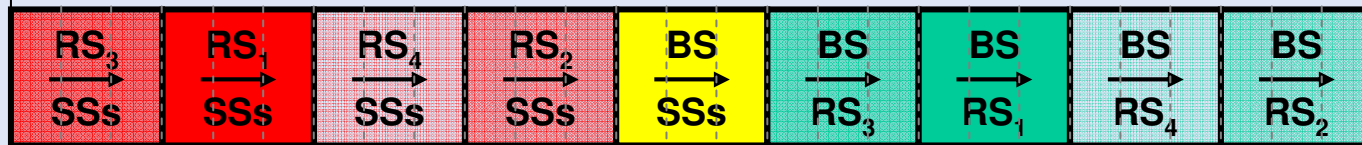
smallest resource entity:
time slot T_s

Fair Resource at RSs

Cell 1

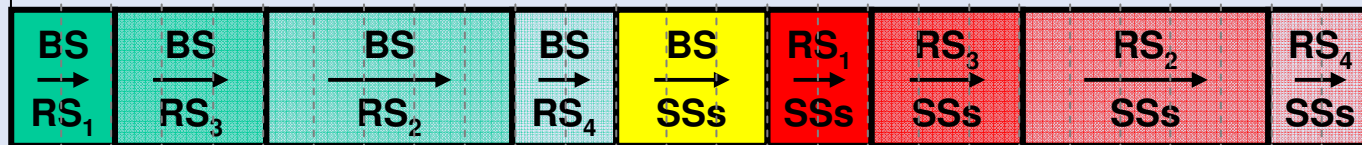


Cell 2

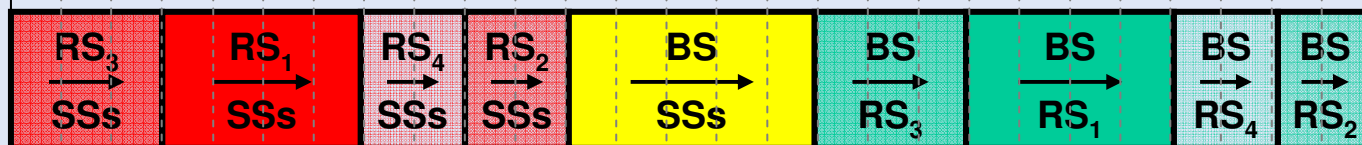


Fair Resource at SSs

Cell 1



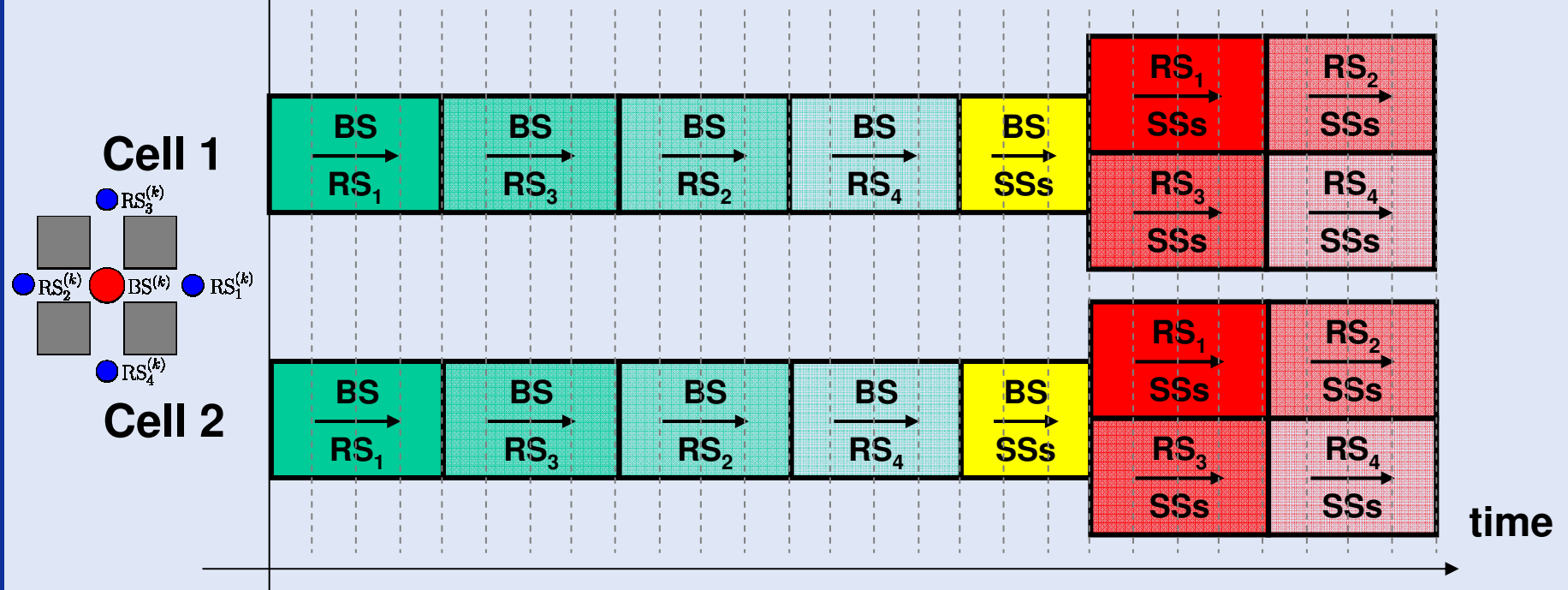
Cell 2



time



Fair Resource at RSs with Intra-Cell Reuse*



- frames must be synchronized across different cells
- only reasonable if resources are shared equally among RSs
- not reasonable if resources are shared equally among SSs

*C. Schultz, B. Walke, R. Pabst, T. Irnich, "Fixed and Planned Relay Based Radio Network Deployment Concepts", *Wireless World Research Forum*, Oct. 2003



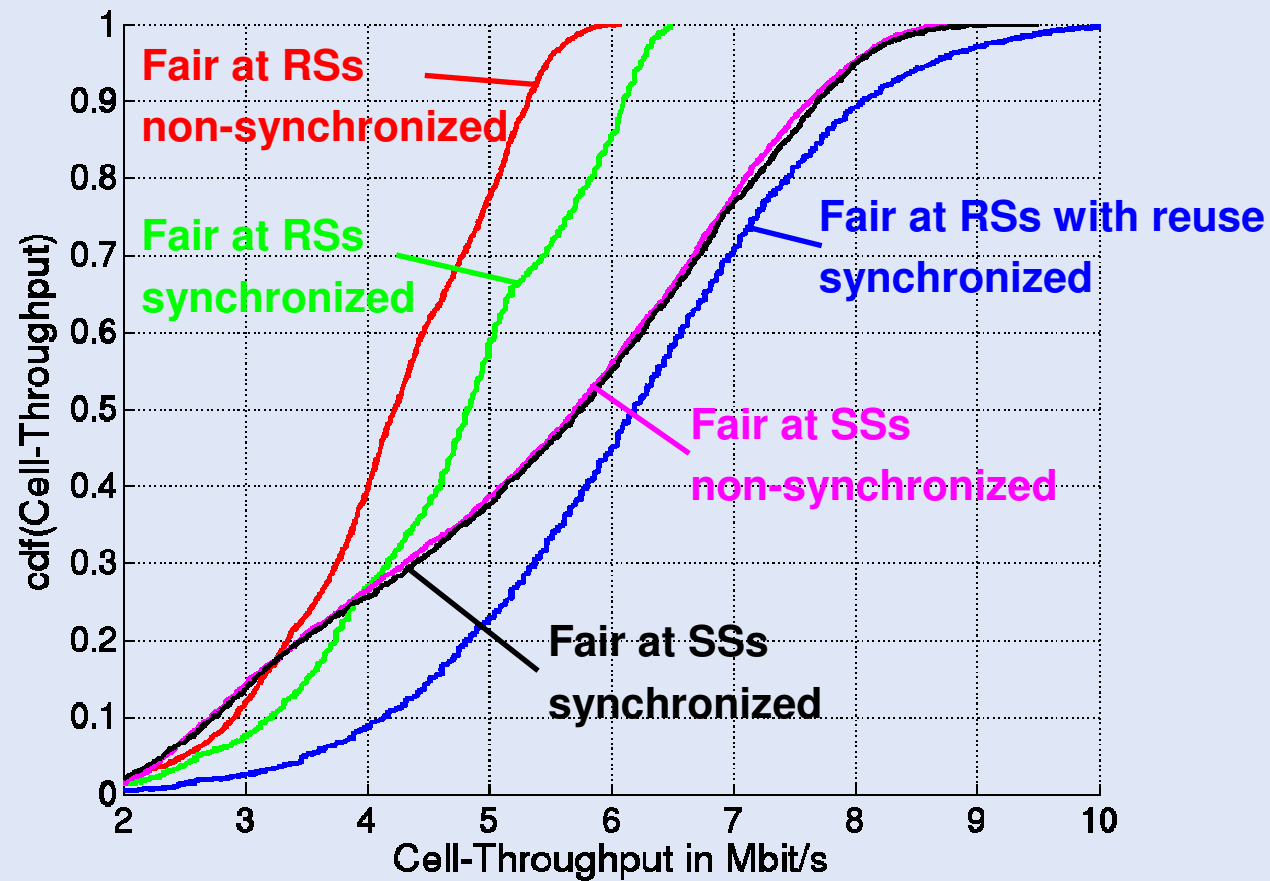
- WiMax 802.16
- FDD Downlink
- Bandwidth 3.5 MHz
- Link-Adaptation: 7 Modulation and Coding schemes
- Center Frequency: 5 GHz
- Directional receive antennas at RSs:
Gain = 10 dBi, Front-to-Back ratio = 30 dB
- Full-Buffer model and Fair Resource scheduling
- Synchronization across cells: yes / no
- Pathloss model according to IST WINNER



Cell-Throughput (1)

Uniform Distribution of SSs

~ 2 SSs per Access Point (BS or RS)

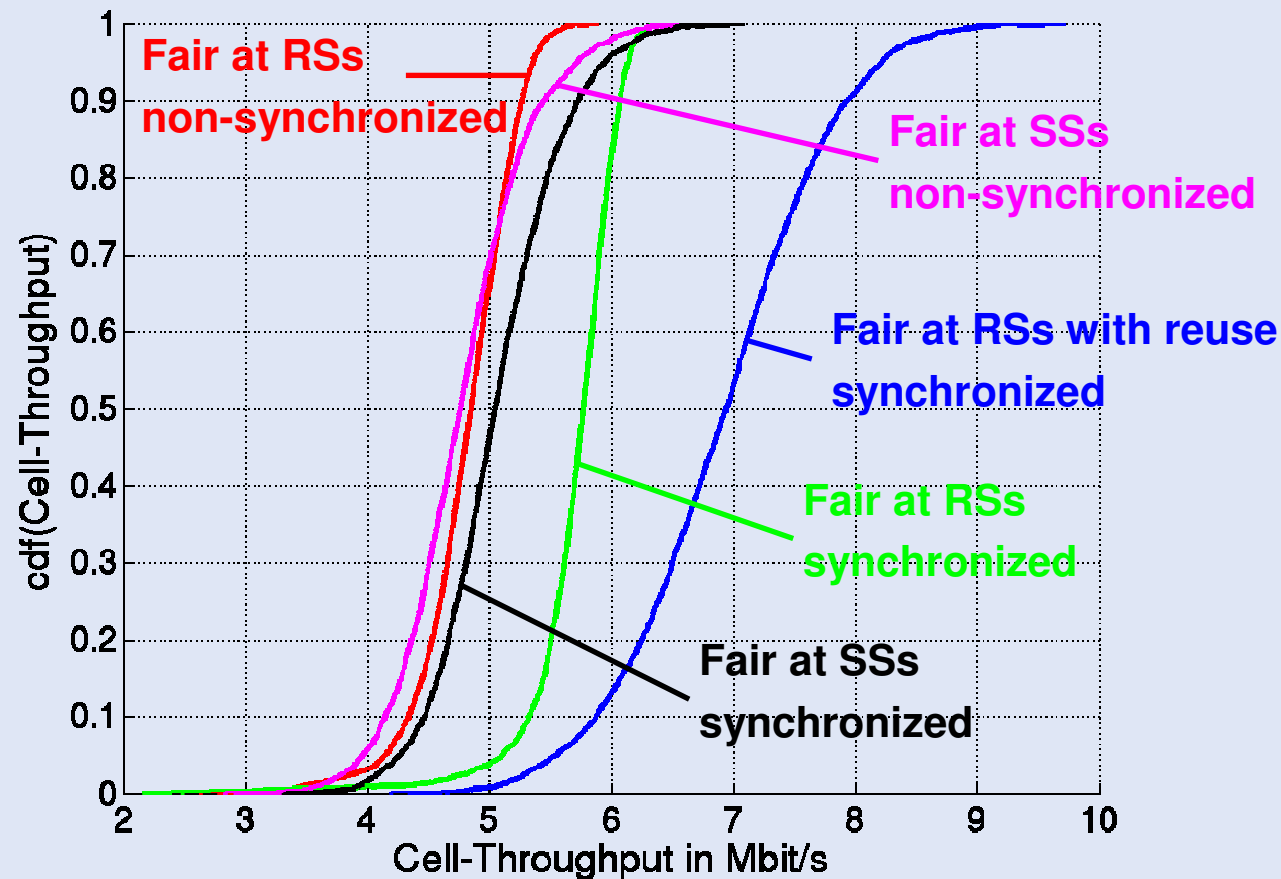




Cell-Throughput (2)

Uniform Distribution of SSs

~ 5 SSs per Access Point (BS or RS)





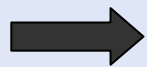
Two Strategies for Resource Assignment

(1) sharing resources equally among all RSs within a cell

- reasonable for high number of SSs
- resources are wasted for small numbers of high-rate SSs

(2) sharing resources equally among all SSs within a cell

- increased interference for high number of SSs
- better performance for small numbers of high-rate SSs



without synchronization across cells, resources should always be shared equally among all SSs



Thank you!