FUNDAMENTAL CROSS-LAYER APPROACH TO WIRELESS NETWORKS

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MAIN CHALLENGES IN WIRELESS COMMUNICATIONS

- Fading
- Multi-user interference
- Power/energy limitation
- Randomly varying traffic
- Distributed implementation
BASIC APPROACH

- Cohesive cross-layer framework
- Fundamental limits and insights
- Joint power control, rate allocation, routing, to maximize throughput and minimize delay
CELLULAR NETWORKS

Base Station

Uplink

Downlink
RESOURCE ALLOCATION FOR UPLINK AND DOWNLINK

Transmitter 1

R_1(t), P_1(t)

Transmitter 2

R_2(t), P_2(t)

Transmitter N

R_N(t), P_N(t)

Packets

Fading State

Queue State

at time t

Controller
MULTI-HOP WIRELESS NETWORKS

Source 1

Source 2

Destination 1

Destination 2
RESOURCE ALLOCATION FOR MULTI-HOP WIRELESS NETWORKS
FUTURE DIRECTIONS

- Distributed implementations
- Multiple antennas
- Delay optimization