Packet Scheduling in Wireless Networks

Kun-Cheng Shih
Multimedia Network Lab,
NTHU
Aug 24, 2001

Outline

- Introduction
- Models
- Design Goals
- Approaches
- My Research
- Future Work and Open Problems

Introduction

- Wireline scheduling: WFQ/GPS (1990)
- Systematic approach: *Service curve* (1995)
- Wireless (LAN) extension (1996)

Models

- Wireless characteristics
  - Scarce radio capacity
  - Bursty channel errors
  - *Location-dependent* channel errors
  - *Time-dependent* channel capacity
- The separation of uplink and downlink
- Power constrained of the mobile hosts

Design Issues and Goals (1/3)

- Service differentiation
- Delay and throughput guarantees for error-free sessions
- *Compensation*
- Fast compensation for real-time sessions
- Long term and short term fairness guarantees

Design Issues and Goals (2/3)

- Channel monitoring and prediction
- The response to channel errors should be configurable through *administrative* controls, i.e., requested QoS profiles.
- *Granularity* problem, e.g., *decoupling* of delay and bandwidth allocation

Design Issues and Goals (3/3)

- Flow separation
- Synchronization between voice and video in *teleconferencing*
- Mechanism and policy should be separated
- Bursty data traffic should be classified

Approaches

- CSDPS (96)
- CSDPS + CBQ (98)
- CIF-Q (98)
- SBFA (98)
- IWFQ (99)
- FEDD (99)
- ELF (00)

My Research (1/2)

- Adaptive Fair Service Curve (AFSC)
- Apply the service curve abstraction to wireless environments
  - Inheritance the results of service curve
  - The advantages of service curve is especially necessary for scarce radio recourse.
- Take link adaptation into consideration

My Research (2/2)

- A *curve adaptation* is invoked in response to channel errors
  - How? Deferment curve
  - When? Adaptation period

$$V_i(v) = \min(V_i(v), D_i(v - v_i(t)) + w_i(t)), \forall v \geq v_i(t),$$

Future Work and Open Problems

- Link adaptation
  - A complete solution for this problem will need coordination between the link layer and the network layer scheduling to support multiple data service classes.
- Scheduling in CDMA networks
  - Multiple servers
  - Multiple link states

Future Work and Open Problems

- Integration of admission control, medium access control , scheduling and congestion control
- Stochastic (soft) guarantees
  - More suitable for real systems
- Practical and progressive realization
  - Core-stateless, relative measures, etc.