2 - Control of Multi-class Queueing Networks with Infinite Virtual Queues

Erjen Lefeber, Technische Universiteit Eindhoven, Eindhoven, 5600MB, Netherlands, A.A.J.Lefeber@tue.nl

We consider a generalization of the standard multi-class queueing network model by allowing both standard queues and infinite virtual queues which have infinite supply of work. We present a possible solution to the problem of finding policies which allow some of the nodes of the network to work with full utilization, and yet keep all the standard queues in the system stable.

3 - A Queue with Skill Based Service under FCFS-ALIS

Ivo Adan, Eindhoven University of Technology, Den Dolech 2, Eindhoven, Netherlands, iadan@tue.nl, Gideon Weiss

We consider a queueing system with multi-type customers and multi-type servers, under FCFS-ALIS policy: A server always picks the first, longest waiting compatible customer, a customer is always assigned to the longest idle compatible server. We derive an explicit product-form expression for the steady state distribution, when service capacity is sufficient, and we also analyze the system under overload.

■ MC61

61- Russell- Hyatt

Joint Session AA/ SPPSN: Airline Scheduling under Competition and Collaboration

Sponsor: Aviation Applications & Public Programs, Service and Needs

Sponsored Session

Chair: Luis Cadarso, Technical University of Madrid, Aeronautics School, Pza. Cardenal Cisneros, 3, Madrid, 28040, Spain, luis.cadarso@upm.es

1 - Revenue and Operational Impacts of Depeaking Flights at Hub Airports

Laurie Garrow, Associate Professor, Georgia Institute of Technology, School of Civil Engineering, 790 Atlantic Drive, Atlanta, GA, 30332, United States of America, laurie.garrow@ce.gatech.edu, Donald Katz

Many US airlines have converted their hub airport schedules from having several flight banks a day to a depeaked continuous schedule. This study assess revenue and operational impacts associated with depeaking flights. By recreating airline schedules and determining how much each airline depeaked and which flights were shifted away from the banks, the lost connections will be assessed as to whether the depeaking strategy was beneficial for the airline and airport.

2 - A Consensus-building Mechanism for Setting Service Expectations in Air Traffic Flow Management

Prem Swaroop, PhD Candidate, Robert H Smith School of Business, University of Maryland, 3330C, Van Munching Hall, University of Maryland, College Park, MD, 20742, United States of America, pswaroop@rhsmith.umd.edu, Michael Ball

We develop a voting-based mechanism for airlines to provide strategic input to the Air Navigation Service Provider. This involves some interesting problems and technologies — largely: voting, optimization models, integer programming and column-generation, multi-attribute valuation models. Through large experiments, we have shown that the proposed mechanism is fairly robust and has promise in addressing the stated problem.

3 - Codesharing Types and Liberalization Agreements: Effects on Frequency and Pricing

Nicole Adler, Hebrew University of Jerusalem, Mount Scopus, Jerusalem, 91905, Israel, msnic@huji.ac.il, Benny Mantin

Governments sign liberalization agreements to regulate the airborne traffic between two countries, whereas airlines engage in codeshare contracts to set the level of coordination and pooling of resources. Empirically studying their effects on international non-stop routes, we find that the level of liberalization has a significant impact on frequency, and that 'free sale' contracts decrease airfares whereas 'block' codeshares have the opposite effect.

4 - Airline Scheduling in Competitive Markets

Luis Cadarso, Technical University of Madrid, Aeronautics School, Pza. Cardenal Cisneros, 3, Madrid, 28040, Spain, luis.cadarso@upm.es, Cynthia Barnhart, Virot Chiraphadhanakul, Angel Marín, Vikrant Vaze

We define competitive markets as those where more than one operator such as airlines and high speed trains operate. We develop a mixed-integer linear optimization model in order to determine an optimal flight schedule and fleet assignment for an airline operating in competitive markets. The market share is

estimated by a piecewise linear approximation of the logistic curve. The objective is to maximize airline profitability. We assume that the strategy from the rest of operators is known. An application of the model for a simplified IBERIA (the major Spanish airline) network is shown.

■ MC62

62- Borein A- Hyatt

Market Mechanisms and their Applications

Cluster: Auctions

Invited Session

Chair: Tunay Tunca, Associate Professor, University of Maryland, Robert H. Smith School of Business, College Park, MD, 20742, United States of America, ttunca@rhsmith.umd.edu

1 - The Use of Optimization to Assist the FCC in a Reverse Auction to Buy Back TV Spectrum

Karla Hoffman, Professor, George Mason University, Mail Stop 4A6, 4400 University Drive, Fairfax, VA, 22030, United States of America, khoffman@gmu.edu, Tony Coudert, Dinesh Menon, Rudy Sultana

This reverse auction is completely voluntary and the broadcasters who do not participate or whose bids are not accepted will be repacked into the remaining reduced TV channels. Bidding options include giving up a license to broadcast over-the-air, sharing the 6-MHz channel with another station, or going from a UHF channel to a VHF channel. This talk will describe the optimization modeling that seeks to minimize the buy-back costs while satisfying interference restrictions.

2 - Optimal Allocation of Local Exclusivity Rights

Changrong Deng, Duke University, Fuqua School of Business, 100 Fuqua Drive, Durham, NC, United States of America, changrong.deng@duke.edu, Sasa Pekec

Multiple identical items are being sold to unit-demand buyers in a network. Buyers are willing to pay a premium if they obtain the item exclusively in their neighborhood. We solve the revenue maximizing mechanism design problem for locally linear exclusivity valuations. We discuss the complexity of the problem and the non-monotonicity of the optimal seller revenues in buyers' valuations. We also present an ascending auction implementation of the optimal mechanism for the clique.

3 - Managing Air Traffic Disruptions through Strategic Prioritization

Ian Kash, Microsoft Research, 7 J J Thomson Ave., Cambridge, CB3 0FB, United Kingdom, iankash@microsoft.com, Douglas Fearing

The current approach for allocating air traffic delays treats flights equivalently regardless of aircraft size, passenger load, etc. We show that significant benefits can be achieved by allowing prioritization. We develop a non-monetary, auction-based scheme for allocating flight priorities which allows airlines to trade-off priorities across airports. In addition to having nice equilibrium properties, our bidding scheme is capable of achieving some of the benefits of congestion pricing.

4 - Optimizing Kidney Exchange with Transplant Chains: Theory and Reality

John Dickerson, Carnegie Mellon University, Computer Science Dept, Pittsburgh, PA, United States of America, dickerson@cs.cmu.edu, Tuomas Sandholm, Ariel Procaccia

Chains, sequences of transplants initiated by an altruistic donor, have shown marked success in kidney exchanges. We prove that chains beyond length 3 do not help in the large. Yet our results from running the UNOS nationwide exchange show improvement with caps up to 13. We analyze reasons for this. We augment the standard model to include various real-world features. Experiments support the theory and help determine what is "in the large". In the dynamic setting, a cap of 4 is better than 5.