Gate assignment

Introduction

Aircraft turn is a process an aircraft (A/C) goes through on the ground between arrival at an airport and departure for the next flight. We exclude taxi-in and taxi-out times and concentrate on the time from arrival at a certain gate to departure from the gate, which is called a puck. The goal of Gate assignment is to assign a gate to every arriving aircraft so there are no overlapping pucks, while satisfying various constraints and optimizing e.g. the total passenger walking distance.

There are several ways to set up this problem. We chose a formulation as a multi-commodity network problem.

Problem formulation

(Mathematical formulation of the problem)

The task

The task will be to

1. Implement the basic model and solve it with Cplex for a set of test data.
2. Add one or several of the below extensions and solve the problem.

Extensions

1. Size of the gate: Not all gates are big enough (or due to other reasons) to receive all aircraft. Let each gate have a list of A/C types it can handle.
2. Neighboring gates. If a large A/C is standing at a gate, a neighboring gate may not have a puck with certain (big) A/C types.
3. Simultaneous operation. It is not possible to tax to/from a gate at the same time as a, neighboring gate.
4. Type of gate. Due to passport control, some gates are for Domestic and some for International flights (in Europe there are also Schengen gates but we ignore that).

5. Buffer. Since it takes time to tax in/out from a gate, there should be a buffer between all pucks.
6. Minimize walking time. We know how many passengers from a flight intend to continue with another flight. We also know the walking time between all pairs of gates. We want to minimize the total walking time for the passengers.

Data

Sabre will provide data containing the following information: Number of gates and their layout, size and type, time schedule of arrivals and departures of individual A/C, A/C type, flight type (dom/int), walking time between gates and number of passengers connecting between flight pairs.