

Modeling and Simulation of Air France Baggage-Handling System with Colored Petri Nets

Dina L. Hafilah*, Andi Cakravastia[†], Younsse Lafdail[‡],
Naly Rakoto[§]

Abstract

Baggage-Handling System (BHS) is a complex system that deals with many factors such as quantity of the bags, interval of arrivals, barcode misreads, early bags and late bags, traveling time and security check. The main role of BHS is to sort and transport all transfer and check-in bags to each destination, that is to the right plane, at the right time. The airport which has the authority to handle BHS has to minimize the number of failed bags in the system. A failed bag means a bag that does not arrive in time for the assigned flight.

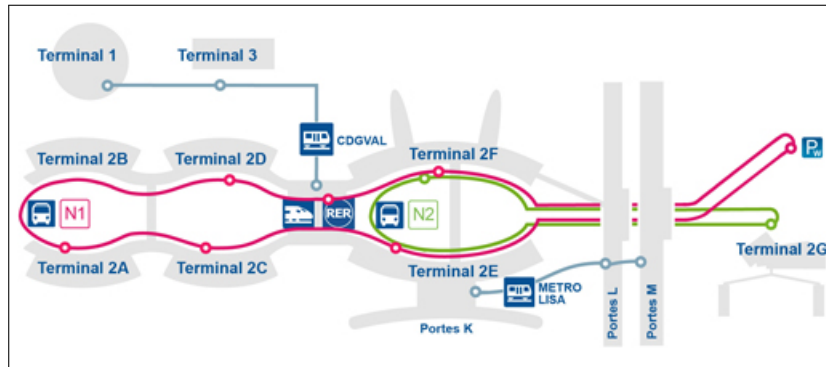


Figure 1: Paris-CDG Airport (Terminal N.2)

Colored Petri Nets (CPNs) extend the classical Petri net formalism with data, time, and hierarchy. These extensions makes it possible to model complex processes like BHS. Furthermore, CPNs are supported by CPN Tools – a powerful toolset that allows the design and analysis of complex processes.

This poster will present a part of large airport's BHS modeling and simulation who deals with more than 20,000 bags per day using CPN Tool. In the real system, barcode is used to keep the unique information on each bag such as time entering the system, assigned flight, and destination gate. This information is interpreted by color set as attributes for each bag in CPN Tool. These attributes are used to sort the bags whether they must go to manual scanning, storage, or directly to destination gate. Sorting is performed by the guard in transition. The main attribute for each entity is the remaining time for assigned flight and the Key Performance Index (KPI) is the percentage of failed bags which have never been considered by simulation papers which do not deal with routing problem. The majority of the papers on BHS focuses on throughput of the system, average time in system, queue size, or waiting time. In this work, we analyze each factor and define the factors which have substantial effect to the system performance. At the end, it will propose the best strategy to minimize the percentage of failed bags.

Keywords: Baggage-Handling System (BHS); Modeling; Simulation; Colored Petri Net.

*D.L. Hafilah is with IMT Atlantique, France and ITB Bandung, Indonesia e-mail: dlaven16@etudiant.mines-nantes.fr

[†]A. Cakravastia is with ITB Bandung, Indonesia e-mail: andi@mail.ti.itb.ac.id

[‡]Y. Lafdail is with Air France, France e-mail: yolafdail@airfrance.fr

[§]N. Rakoto is with IMT Atlantique and LS2N, France, e-mail: naly.rakoto@mines-nantes.fr