

# HONG KONG INTERNATIONAL AIRPORT

## System for Allocating Check-In Counters



**H**ong Kong Kai Tak International Airport is among the busiest airports in the world. In 1995, it handled 27.4 million international passengers and 1.46 million tons of air cargo. It is capable of handling 5,300 arriving and departing passengers per hour. With so much traffic, the Hong Kong Civil Aviation Department is constantly looking for ways to improve the services that have made Kai Tak the envy of airports worldwide.

The allocation of check-in counters to agents and baggage handlers is done daily. It is a highly complex task because airport management must maintain the high quality of customer service while satisfying the needs of the airlines and the airport and ensuring delayed flights do not disrupt the smooth operation of the departure hall. Efficient check-in service is vital to the airport's image, which is maintained through keeping high the standards of all the airport's services.

To smooth out the allocation process, the civil aviation department had the software consultancy RTL develop a scheduling application that weighs the needs of all the parties concerned, and for the core of the application, RTL choice ILOG Solver and its C++ constraint-based engine.

*"ILOG class libraries have tremendously accelerated and simplified the development of an extremely sophisticated and powerful airport resource allocation and planning system. ILOG constraint programming technology slashed planning time down to seconds and increased airport productivity by optimizing its operations."*

■ **Dr. Andy Chun**  
Principal Consultant  
RTL

## RTL

Resource Technologies Ltd., Hong Kong, is a software consulting firm specializing in object-oriented technologies for client/server applications. It provides training and consulting services in OOAD, CORBA, object databases and OO modeling, and systems design and development in C++ and Java. RTL is a distributor for Iona Technologies, ILOG, Rational Software and ObjectDesign. RTL is a member of the Hong Kong Industrial Technology Centre Corp. For more information, visit <http://www.rtl.com/~rtl>.

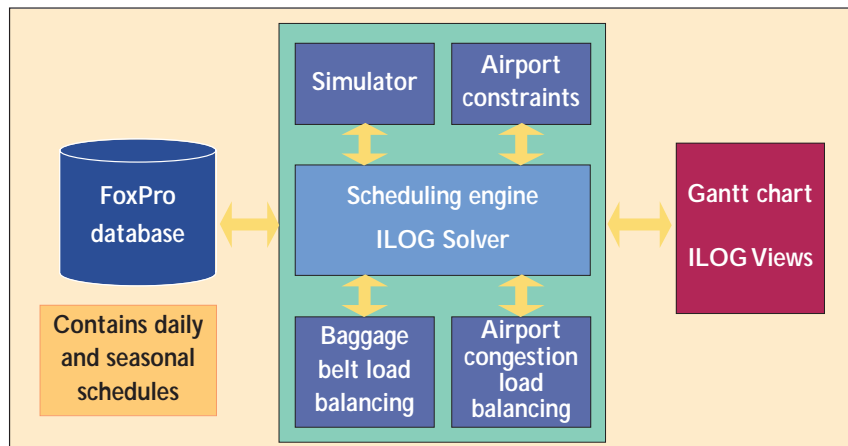
## About ILOG

ILOG is a leading provider of advanced software components for graphics and resource optimization.

ILOG products deliver high performance data visualization for 2D and 3D user interfaces; integer, linear and constraint solvers for resource optimization, scheduling, logistics and planning applications; dynamic rule systems for intelligent agents and real-time data flow control, and components for integrating modules with real-time and relational data sources.

ILOG was founded in 1987, and now employs approximately 350 people in seven countries. ILOG recently acquired CPLEX, a leader in linear optimization. Visit <http://www.ilog.com/> for more information.

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**CCCAS architecture**

## A better way to assign check-in counters

The old allocation system was done by hand, with the check-in counter assignments entered into the airport's computerized information directories, which handle the check-in information displays. As passenger volume grew over the decades, the civil aviation department found the old system too cumbersome, so it commissioned the development of the computerized check-in counter allocation system (CCCAS) to handle the increasingly complex, time-consuming task. The CCCAS system applies ILOG Solvers C++ constraint-based engine in allocating counters, updating passenger information boards, planning conveyor belt loading and generating seasonal schedules.

The system starts with the daily flight schedule, assigning counters to departing flights. ILOG Solver assigns counters based on operational constraints that may include grouping together flights of the same airline or meeting airlines' requests for counters in certain sections of the departure hall.

To avoid congestion, historical data is used to adjust allocations according to the physical layout of the airport. The system also uses seasonal flight schedules for long-term planning, so counters are assigned fairly and consistently from one week to the next.

## Project

A prototype was built to determine many of the scheduling features of the final version. Three phases were then implemented to incorporate a database, a user interface and a simulator. The system was run in parallel with the manual system for several months before CCCAS was brought into full operation in October 1996.

## Benefits

The manual method for assigning counters could take up to 1.5 person-days, with no guarantee of consistently allocating counters well. CCCAS not only consistently generates good plans, but also takes only four seconds to render a day's schedule. Seasonal allocation, which used to take a week, now takes just a few minutes. ILOG Solver respects all the constraints, making sure none of them are violated. The check-in counters of flights operated by the same airline can be kept together, making their access more convenient for the airline's staff and passengers. Conveyor belt capacity is no longer exceeded, greatly reducing the risk of mechanical failure and consequential delays, and delayed flights are handled with reactive scheduling, so they do not affect the check-ins of other flights. Good scheduling has meant shorter lines, less congestion and faster check-in, resulting in greater customer and staff satisfaction.