2007–2008 D4 Networks Computer Science Clinic

Bringing Charter Flight to the Web

online charter flight reservations and scheduling with efficient per-seat pricing

Problem Statement

D4 Networks (now U Fly) hired an HMC Math Clinic to create an optimization algorithm for charter flight scheduling that reduced costs and increased efficiency for charter flight business operators. Their solution accomplished this by combining flights and allowing charter operators to pool resources in order to reduce flight prices and make those prices competitive with those of commercial air.

The 2007–2008 HMC Comptuer Science Clinic team used this existing optimization algorithm in a fully functional Internet application that is easily accessible to both charter operators and customers. The team accomplished this through carefully developing user interfaces and integrating a bespoke database backend and the math clinic’s optimization engine.

Technology and Design

The clinic team made heavy use of a variety of technologies during the creation of the application. These include ASP.NET, C#, SQL, AJAX, JSON, the Yahoo User Interface Library, and several Google APIs, including Google’s Maps API and Geocoding API.

After initial requirements-gathering, the team employed a multi-phase, iterative design process detailed in the next panels to the right and below:

Test-Driven Development

The team used a test-driven development model to design and implement the web application. The steps roughly consisted of:

1. Design: carefully develop a UML model
2. Implement: For each class, the team
   a) first provided stub functionality
   b) created tests from system use cases
   c) implemented functionality and tested iteratively

Final Product

We have successfully deployed

1. the internet application, ready to be transferred to D4’s servers. This includes the customer and charter operator user interfaces discussed extensively elsewhere.
2. an interface for the 2006–2007 HMC Math Clinic’s linear program solver
3. a robust, custom-tailored database backend, storing user, flight, charter operator, and airport information.

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User Interface Design

A crucial element of the team’s design process was iteration, as demonstrated by this series of design prototypes for the front page.

To the left are several sketches and mockups generated during the design process as retrieved from the source code repository. After each one of these designs was created, a variety of likely users were asked to view the designs and suggest improvements, which were incorporated in the next design revision. This happened several times per page.

After starting with paper prototypes, the team created versions in HTML that would simulate the look-and-feel of the completed application and again took these prototypes to representative users for testing. Source code integration then tied the static webpages into the C# backend to create a dynamic web application.