

System Requirements

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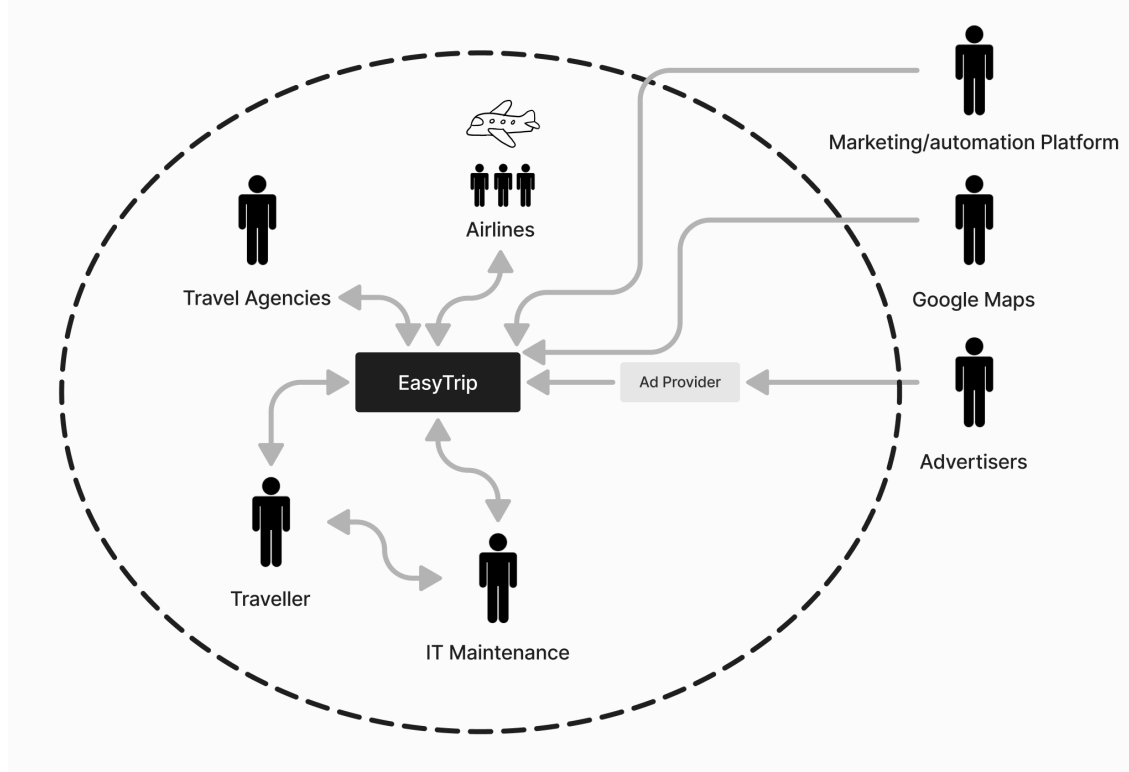
1 Introduction

1.1 Naming convention

The naming convention used for requirements are the following. F1, Q1, D1, is short for Functional, Quality and Data requirements. The overall goal of the system is to provide a platform for users to find cheap flights while driving revenue for the business and gain market share.

1.2 Context Diagram

The context diagram illustrates the systems key stakeholders in the inner domain. This includes travellers, travel agencies, airlines, IT maintenance and ad providers. In the outer domain, the context diagram shows marketing platforms, Google Maps for displaying maps and advertisers.



1.3 Business Goals

The system should help gain revenue by providing features that attract more customers and encourage existing customers to fly more. By differentiating the product from competitors, using unique data visualization, the system should be able to gain a competitive advantage. See figure 1 and 2 for a visual representation of the system.

The system should include features that improve customer satisfaction and loyalty, leading to higher customer retention rates.

The system should support features that enable the business to reach new markets and customer segments. This could include new types of users that not only want to find cheap flights, but also finds where they can travel for a certain budget.

2 Elicitation

2.1 Interviews of Travellers

In order to determine traveller goals and needs as well as to validate the product idea of Easytrip, data has been elicited from potential travellers. The data was collected from semistructured interviews with 2 participants. The participants were chosen based on people that we know are frequent travelers. The interviews were conducted in a casual setting, and the recorded data is anonymous.

An interview guide was used to ensure consistency among the interviews. The guide was structured in three parts: Introduction, experience with existing travel planning tools, questions regarding the process to finding cheap flight, as well as closing questions.

2.1.1 Results

The participants (N=2) had an average age of 24 years and both had similar prior experience with using travel planning tools. They both used airplane travel one or two times each year, mostly for vacation. For shorter destinations, travel by car or train was desired to minimize their environmental footprint. Both believe that the most important factor when booking a flight is price, but other factors such as layovers and travel dates were also mentioned. Additionally, they value flexibility and personalization in the booking process.

2.1.2 Problems

One of the participants found it stressful how algorithms increase prices when refreshing the page. Booking through third-party platforms was also brought up as a problem since the participant had experienced multiple crashes. The other participant expressed frustration with the lack of transparency in pricing, with some sites having hidden baggage fees and unclear total costs making price comparisons between flights difficult.

2.1.3 Finding Cheap Flights

Participants used different methods to find cheaper flights. One preferred sorting by the lowest available prices and using price prediction tools like those in Hopper. The other valued flexible date search options and price calendars that displayed price variation over time. This suggests a need for a tool that combines multiple features to find the best deals hinting for a flexible design depending on user preferences.

2.2 Stakeholder Analysis

Our stakeholders include competitors such as Momondo and Flight Scanner, travel agencies providing data partnerships, airline companies indirectly benefiting from bookings, end travellers, travelers, providing feedback, IT maintenance and development teams, and non-obvious actors such as the support department. Each stakeholder have different needs and goals, and it is important to understand these in order to create a successful product as well as to manage the relationships and expectations of the stakeholders.

2.2.1 Airlines

Since airlines are EasyTrips main source of data, information is needed regarding API endpoints for fetching price, date and times, availability based on travellers' search queries. Also, agreements on business models for affiliate links will be needed to ensure revenue channels. Additionally, real-time updates on flight status and any changes in schedules will be required to maintain accurate and up-to-date information for our travellers.

Airlines benefit from increased visibility, effectively using EasyTrip as a marketing and sales channel. By providing accurate and real-time data, airlines can attract more customers and increase

their revenue through the platform. The competition between airlines is also reflected in the platform, as travellers will compare prices and services, increasing the pressure on airlines to provide competitive offers and maintain high service quality.

The platform has a strong dependency on airlines for providing accurate and timely data. Inconsistent or outdated flight information could negatively impact traveller experience and trust in our platform. Changes in airlines' API or business models could lead to disruptions and additional development costs and maintainment costs on our end. Airlines could withdraw from agreements, affecting our affiliate revenue stream. Any inaccuracies or delays in data could reflect poorly on their services and reputation.

Airlines may suggest improvements such as dynamic pricing or marketing campaigns to maximize mutual benefits. Potential collaboration could be prioritizing a airline in the search results, or offering exclusive deals to travellers. These collaborations could be beneficial for both parties, as it would increase the visibility of the airline and create a new revenue stream for us.

2.2.2 Travel Agencies

Travel agencies provide data partnerships and EasyTrip needs access to their data regarding flight offers in a similar way that we are dependent on the airlines' data.

Travel agencies benefit by reaching more customers through the platform in a similar way as for airlines. The main difference is the advantage of being able to combine multiple airline in routes including multiple layovers. This is a service that airlines do not provide. Therefore, travel agencies can promote deals and lead customers to additional purchases since they also provide accommodations and other travel services. Both airline and travel agencies benefit from increased visibility and bookings through the platform, effectively using us as a marketing and sales channel.

There are risks that travel agencies could provide inconsistent data, leading to inaccurate package pricing or availability issues. Competition between agencies could result in disputes over featured listings. Also, there is a risk of agencies withdrawing from agreements, affecting our affiliate revenue stream. The platform is dependent on the travel agencies for providing accurate and timely data. Similar to the airline can changes to API or business models could lead to disruptions and additional development costs and maintainment costs on our end. Favoring of competitors could also be a risk, as the agencies might prioritize other platforms over EasyTrip. The agencies might have exclusive deals and partnerships with other platforms, which could limit the provided data.

Similar to the airlines is the potential to include promotional campaigns targeting high-demand destinations. This could be beneficial for both parties. However, such agreement would need to be carefully negotiated to ensure that both parties benefit from the collaboration, without hurting the relationship to other stakeholders. For the development process, travel agencies could also provide feedback on the platform and suggest improvements to the traveller interface or features to ensure that their data is presented in the best possible way.

2.2.3 Travellers

To provide a personalized experience, the platform needs information about travellers budget constraints, destinations and travel dates. Optionally, personal data such as email can be gathered to enable notifications on price changes. Also, feedback on their traveller experience crucial for the improvement and future of EasyTrip.

Travellers benefit from accurate, real-time price comparisons, and personalized recommendations. They gain time efficiency and cost savings when planning trips. Additionally, travellers are the main source of revenue for the platform, as they generate bookings and affiliate revenue. Therefore, user satisfaction and loyalty are crucial for the success of the platform. By providing feedback and suggestions, travellers can influence the platform's development and improve their overall experience. This could lead to increased retention and engagement, meaning travellers will return to the platform for future travel planning.

The dependency on airlines is a factor that can generate issues such as inaccurate flight information, delayed notifications, or privacy concerns. If travellers feel their data is not secure or their preferences are not being met, they may lose trust in the platform and seek alternatives.

To mitigate these risks, EasyTrip will implement validation and consistency checks to ensure accurate flight information. Additionally, the platform will provide clear and transparent privacy policies to address any privacy concerns. Regular traveller feedback will also be gathered by interviews and forums to identify possible problems with the system.

2.2.4 IT Support and Maintenance

The IT support team requires a comprehensive administration interface to monitor system errors, API updates, and data quality from airlines and travel agencies. They need access to logs, error reports, and real-time data feeds to ensure the system's integrity and performance. Since payment and booking are handled by airlines or travel agencies, the IT support team does not need access to payment information, allowing them to focus on technical issues and system maintenance.

The IT support team is crucial for maintaining the platform's reliability and performance. They ensure that data from airlines and travel agencies is accurate and up-to-date, which is essential for traveller trust and satisfaction. By resolving technical issues promptly and ensuring seamless API integrations, the IT support team helps maintain the platform's reputation and operational efficiency.

The IT support team faces risks such as system downtime, and technical issues that could disrupt the platform's functionality. Not enough monitoring and delayed response to issues can lead to prolonged outages, negatively impacting traveller experience and trust. Additionally, the team must stay updated with API changes from airlines and travel agencies to prevent integration issues. To resolve this, an error handling system must be in place to detect and address issues promptly.

To mitigate these risks, the IT support team will implement robust monitoring and alerting systems to detect and address issues promptly. Regular updates and maintenance schedules will be established to ensure system stability. Collaboration with airlines and travel agencies will be maintained to stay informed about API changes and updates. Additionally, the team will conduct regular data quality checks and validation processes to ensure the accuracy and reliability of the information presented on the platform.

2.2.5 Competitors - Momondo, Flight Scanner

EasyTrip needs detailed information about the features, pricing models, and user interfaces of competitors like Momondo and Flight Scanner. Specifically, insights into how they handle flight data aggregation, display recommendations, and optimize search algorithms are critical. Also, understanding their business model will be important since EasyTrip will have similar revenue streams as the competitors, using affiliate marketing strategies and partnerships with airlines.

Competitors may benefit from increased visibility and bookings, similar to EasyTrip. However, their primary stake is competitive, as they aim to attract and retain a larger user base. Their ability to secure exclusive partnerships may impact our access to data and revenue streams. However, since EasyTrip is rather for finding where the cheapest flight is, the competition has a different perspective on the market. They are more focused on providing a flight price comparison for travelers already knowing their destination.

Competitors have several risks to EasyTrip, such as attracting potential travellers with more competitive pricing, better deals, or superior user experience. Established competitors can also secure exclusive data partnerships, limiting EasyTrip's access to certain deals or flight information. Also, their already established brand loyalty can make it challenging for EasyTrip to gain market shares.

To minimize the risks, EasyTrip can focus on differentiating itself through innovative features, such as visualization of flight data. EasyTrip can also emphasize user experience by providing intuitive search tools. Collaboration with smaller travel agencies or airlines could help secure

unique offers that competitors may not have access to. EasyTrip can also leverage feedback from users to continuously improve its platform and stay competitive.

2.3 Conflicting Stakeholder Interests

The table below explains the key conflicts between stakeholders and possible solutions for resolving them:

Stakeholders Involved	Conflicting Interests	Potential Solutions
Airlines vs. Travel Agencies	Airlines prefer direct bookings, while travel agencies benefit from combining routes	Negotiate fair partnerships where travel agencies promote airline offers and bundle other services effectively.
Airlines vs. EasyTrip	Airlines may want preferential treatment in search results	Maintain neutrality by implementing a transparent ranking system based on user preferences, not payments.
Competitors vs. EasyTrip	Competing for user base and exclusive airline partnerships	Differentiate through unique features, personalized services, and feedback-driven innovation.
Travellers vs. Airlines	Travellers want low prices, while airlines focus on maximizing profit	Implement dynamic pricing with filters to show budget-friendly options alongside premium offers.
IT Support vs. Airlines/Agencies	API changes by airlines or agencies may cause disruptions	Maintain regular communication with API providers and implement fallback mechanisms to reduce downtime.

2.3.1 Resolving Conflicts

To resolve conflicts, EasyTrip will establish internal clear and transparent guidelines for collaboration and prioritize creating beneficial agreements for multiple stakeholders. Keeping strong relationships using regular communication with airlines and travel agencies is important, especially due to our dependencies on their data. Feedback from travellers will probably be the greatest prioritization, ensuring user satisfaction without compromising data partnerships. A robust monitoring system will be implemented to manage technical dependencies and reduce the risk of conflicts affecting platform performance.

2.3.2 Alternative Data Sources - Flight Scanner API

In case of losing access to airline data, EasyTrip will use Flight Scanner API as an alternative data source. Flight Scanner provides similar data on flight prices, availability, and schedules, which could be used as a backup plan. However, this would require a different business model, as Flight Scanner does not provide affiliate marketing strategies. Instead, EasyTrip could rely solely on ads as a revenue stream. This alternative data source could be used as a backup plan in case of disruptions, changes in airline data access and for distribution of risk.

2.4 Elicitation of easyJet

To further enhance our stakeholder analysis and gather more information about the stakeholders, both competitors such as Momondo and Flight Scanner, as well as airlines such as SAS and Norwegian and 45 other airlines, were contacted. The purpose of the contact was to gather information about their needs, pricing strategies, and API endpoints.

EasyJet is a low-cost airline that operates in Europe. The airline was contacted via email and questions were asked about traveler challenges, API endpoints and limitations, data display requirements and other considerations. The following information was gathered from the contact:

2.4.1 Challenges Faced by Travellers

EasyJet highlighted that while its booking system is designed to be user-friendly, travelers often face difficulties when trying to manage bookings across different platforms such as third party solutions like Travel Agencies. Seamless integration of third-party platforms with airline booking systems is a key challenge that can be improved upon to enhance the user experience.

2.4.2 API Integration and Real-Time Data

EasyJet pointed out the importance of API integration that supports real-time updates on flight schedules, prices, and availability. While they did not reveal specific technical details about their API agreements, they recommended that any travel planning tool prioritize accuracy, data privacy, and security. This ensures users have up-to-date information and maintain control over their personal data.

2.4.3 Display Requirements

Although easyJet did not provide detailed requirements for how their flights and promotions should be displayed on third-party websites, they underscored the importance of maintaining high data standards and compliance. Platforms like EasyTrip would need to adhere to data usage agreements and provide transparent privacy policies.

2.4.4 Use of Publicly Available Resources

Due to prioritization on enhancing user experiences on their own platforms, easyJet was unable to offer a dedicated meeting. Also they were unable to share details about their pricing strategies or data-sharing agreements with our competitors. However, they encouraged us to use publicly available resources on their website for information regarding booking processes, and user services.

2.4.5 Underutilized Features in Flight Comparison Tools

Although easyJet did not specify which features they believe are underutilized in current flight comparison systems, they truly emphasized on data accuracy, privacy, and ease of booking management. This suggests that addressing these areas could lead to significant improvements.

2.4.6 Takeaways

1. EasyTrip will need to explore API partnerships that prioritize real-time data updates, potentially collaborating with services like Flight Scanner as a backup plan or as the primary data source in the minimal viable product.
2. Enhancing seamless management of bookings across platforms could address key pain points identified by easyJet. Excluding booking features could be a strategic decision to avoid direct competition with airlines and to focus on providing a user-friendly flight comparison tool. This resolve the conflict of interest between airlines and EasyTrip.
3. Implementing clear data privacy policies and ensuring compliance with third-party agreements will be critical to avoid any data-related issues. This will help build trust with airlines and travelers, and maintain a positive reputation in the industry. The use of cookies and data collection should be transparent and in accordance with GDPR regulations to favor the travellers.

3 Functional Requirements

The following functional requirements have been identified for the EasyTrip system.

F1-G: Travellers can find destinations with cheap flights when providing a departure city and dates. Goal-level requirement defining a key system function.

F2-D: Travellers should be able to provide a range of possible dates. Domain-level functionality supporting flexible searches.

F3-D: Travellers can have their device provide their current location. Domain-level feature leveraging geolocation services.

F4-D: Travellers can find cheap flights to a given destination. Domain requirement focusing on the flight search feature.

F5-P: Travellers can see a text list of cheap flights to a destination. Product-level feature for displaying search results.

F6-P: Travellers can see prices for multiple tickets. Product-level requirement enabling comparison of ticket prices.

F7-P: Travellers can see destinations with cheap flights on a heatmap. Product-level feature enhancing visualization. See an example in figure 2.

F8-D: Travellers can change the dates for which the map shows data. Domain-level control for flight search customization.

F9-P: Travellers can see a text list of destinations with cheap flights. Product-level display of destinations based on search.

F10-P: Traveller can click through to ticket booking page for shown flights. Product-level requirement enabling ticket purchase.

F11-P: Travellers can select airports from the heatmap. Product-level feature allowing interactive selection.

F12-P: Travellers can find prices of multi-flight trips. Product-level requirement for multi-leg trip pricing.

F13-G: Travel agencies can find flights on behalf of clients. Goal-level requirement supporting B2B services.

F14-P: Travellers should be able to create accounts with email addresses and passwords. Product-level authentication requirement.

F15-D: The ownership of travellers' email addresses should be confirmed. Domain requirement ensuring valid accounts.

F16-P: Travellers should be able to change their email address. Product-level account management feature.

F17-P: Travellers should be able to change their passwords. Product-level security feature.

F18-P: Travellers should be able to reset their password if they have forgotten it. Product-level usability requirement.

F19-D: Travellers should be asked about receiving marketing emails. Domain-level requirement ensuring compliance with marketing preferences.

F20-P: A signed-in traveller can save favorite cities. Product-level feature for personalization.

F21-G: Product manager can request a statistics report. Goal-level requirement for system analytics.

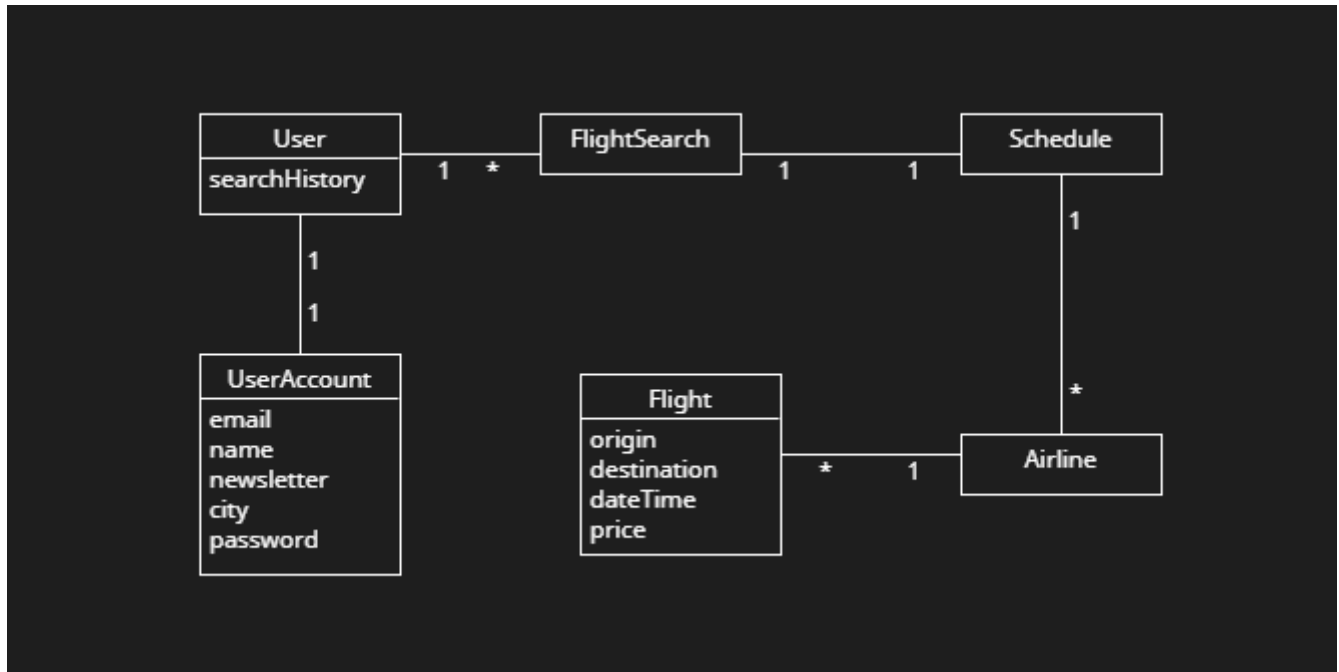
F22-P: Marketer can have marketing email sent to relevant consenting travellers. Product-level marketing function.

4 Data / Non-Functional Requirements

4.1 Data Requirements

4.1.1 Data Model

The design level data requirements are represented through a E/R diagram:



4.1.2 Data Dictionary

DR2: Domain level data requirement

Class: User The user is a Traveller or Travel Agency who has a user account in the product.

Examples: 1. A traveller who has a user account. 2. A travel agency who uses their user account to search flights.

Attributes: email: Text, 320 chars The user's email address. This email address is used for communication with the user outside the product.

name: Text, 50 chars The name of the traveller or travel agency using the account.

newsletter: Boolean Whether the user wants mass email's from the product or not.

city: Text, 35 chars The city the user's default origin is set to. This is the standard origin used when performing searches for the user.

4.1.3 Virtual window

Create a virtual window that shows the data that is to be displayed in the system.

See this example

Field	Value
Email	example.John@gmail.com
Name	John Doe
Utskick	True False
City	New York

From	Price Max	To
NY	3000 SEK	CPH
CPH	2500 SEK	NY
...

5 Quality Requirements

5.1 Quality Requirements

FR ID	QR ID	Description	Measurement	Why
F1-G	Q1-P	Search results should be displayed within 2 seconds for a standard query.	Tested by generating random inputs and measuring response time using automated performance testing tools, logging response times for 1000+ random queries.	If too slow, users may switch to competitors.
F2-D	Q2-D	The system should support flexible date ranges spanning at least 30 days for price comparisons.	Test by selecting a range of 30-60 days, verifying the system returns results across all days without errors.	To be added
F3-D	Q3-D	Location detection should be completed in under 3 seconds with at least 95% accuracy.	Use GPS data from 50 or more test cases across different devices and measure accuracy based on expected vs. detected locations.	To be added
F4-D	Q4-P	The system should retrieve and display flight prices within 2 seconds for a standard query.	Execute automated tests simulating 1000+ searches and log the response time until results are fully rendered. Primarily same as Q1-P	To be added
F5-P	Q5-P	The list should support sorting by price, duration, and airline, with sorting applied in under 1 second.	Use UI performance tests to time sorting actions on datasets of varying sizes for example destinations with a lot of flights or destinations with less flights.	To be added

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FR ID	QR ID	Description	Measurement	Why
F6-P	Q6-P	The system should allow searching for up to 10 passengers simultaneously without affecting response time.	Compare response times of searches with 1 vs. 10 passengers under normal and peak loads.	To be added
F7-P	Q7-D	The heatmap should update dynamically within 3 seconds of data input or changes.	Time updates after input changes for example destination, price range or starting point across different devices.	To be added
F8-D	Q8-D	The map should reflect date changes in under 2 seconds without requiring a full reload.	Monitor UI logs to confirm rendering completion time after date modifications.	To be added
F9-P	Q9-P	Destination lists should be updated in real-time when new flight deals become available.	Insert a new deal in the back-end or get deal from airlines API and verify update propagation within milliseconds.	To be added
F10-P	Q10-P	Clicking a flight should navigate to the booking page within 1 second and fill in relevant details from users account.	Use automated UI testing to time redirection and fill in data according to users account.	To be added
F11-P	Q11-P	Selected airports should be highlighted instantly and search results updated in under 2 seconds.	Measure UI update times via browser dev tools or performance logs.	To be added
F12-P	Q12-P	The system should retrieve multi-flight prices in less than 5 seconds, considering layovers and airlines.	Run tests for complex multi-leg searches, logging response times for different scenarios.	To be added
F13-G	Q13-G	Travel agency accounts should support handling at least 50 concurrent searches without slowdown.	Simulate 50+ concurrent users with load-testing tools for example JMeter and measure system response time.	To be added
F14-P	Q14-D	The registration process should take no longer than 15 seconds, including email verification.	Automate user sign-ups and measure time from form submission to receiving the verification email.	To be added

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FR ID	QR ID	Description	Measurement	Why
F15-D	Q15-D	Email verification links should be sent within 5 seconds and expire after 24 hours.	Log email dispatch times in the system and verify expiration behavior after 24 hours.	To be added
F16-P	Q16-P	Changes to email addresses should be confirmed within 10 seconds via a verification email.	Track the end-to-end time from submission of email change request to email receipt.	To be added
F17-P	Q17-P	Password changes should be effective after 5 seconds and require strong passwords (at least 8 characters, uppercase, lowercase, number, symbol).	Verify enforcement of password complexity rules and Ensure old credentials become invalid 5 seconds after post-update.	To be added
F18-P	Q18-P	Reset emails should be sent within 10 seconds and expire after 30 minutes.	Log email dispatch times and attempt password resets after 30 minutes to confirm expiration.	To be added
F19-D	Q19-D	Marketing email preferences should be configurable and updated in real-time.	Toggle marketing settings in the Account management section and verify backend logs reflect changes 5 seconds.	To be added
F20-P	Q20-P	Favorite cities should be stored 5 seconds and retrievable in under 1 second.	Save favorite cities and time retrieval speed via API performance monitoring.	To be added
F21-G	Q21-G	Reports should be generated in under 10 seconds for a dataset covering the last 6 months.	Execute test report requests and measure query execution and rendering time.	To be added
F22-P	Q22-P	Marketing emails should be delivered to 95% of recipients within 1 minute of sending.	Track email delivery timestamps for mass campaigns and compute success rate over time.	To be added

6 Release Plan

Release	Feature	Priority	Prioritization Motivation / Explanation
4	Feature 1	High	Explanation for Feature 1
4	Feature 2	Medium	Explanation for Feature 2
4	Feature 3	Low	Explanation for Feature 3
5	Feature 1	High	Explanation for Feature 1

	Feature	Priority	Prioritization Motivation / Explanation
5	Feature 2	Medium	Explanation for Feature 2
5	Feature 3	Low	Explanation for Feature 3

Release 4:

- F8-D Q8-D The map should reflect date changes in under 2 seconds without requiring a full reload. See figure 2.
- F2-D Q2-D The system should support flexible date ranges spanning at least 30 days for price comparisons. See figure 2.
- F3-D Q3-D Location detection should be completed in under 3 seconds with at least 95% accuracy.
- F4-D Q4-P The system should retrieve and display flight prices within 2 seconds for a standard query.
- F5-P Q5-P The list should support sorting by price, duration, and airline, with sorting applied in under 1 second.
- F7-P Q7-D The heatmap should update dynamically within 3 seconds of data input or changes.
- F8-D Q8-D The map should reflect date changes in under 2 seconds without requiring a full reload.

Release 5:

- F15-D Q15-D Email verification links should be sent within 5 seconds and expire after 24 hours.

7 Validation List

1. Overall Validation

- Are the stakeholders goals and needs covered by the requirements?
- Are the business, domain, product and design level goals covered by the requirements?
- Are the requirements justified?
- Are the requirements aligned with user and business needs?
- Are the system boundaries and requirements defined?
- Are the goals covered by the requirements?
- Are the requirements testable?
- Are the requirements complete?
- Are the requirements consistent?
- Are the requirements traceable?
- Are the requirements feasible?
- Are the requirements unambiguous?
- Are the requirements verifiable?
- Are the requirements clear and concise?

2. Quality Validation

- (a) Does the requirements specifications cover performance?
- (b) Does the requirements specifications cover usability?
- (c) Does the requirements specifications cover safety and security?
- (d) Does the requirements specifications cover reliability?
- (e) Does the requirements specifications cover availability?
- (f) Does the requirements specifications cover fault-tolerance?
- (g) Does the requirements specifications cover maintainability?
- (h) Does the requirements specifications cover portability?
- (i) Does the requirements specifications cover scalability?
- (j) Does the requirements specifications cover interoperability?
- (k) Does the requirements specifications cover compliance?
- (l) Does the requirements specifications cover privacy?

3. Special case Validation

- (a) Does the requirements specifications cover data visualization?
- (b) Does the requirements specifications cover data aggregation?
- (c) Does the requirements specifications cover the heatmap of destinations with cheap flights?
- (d) Does the requirements specifications cover the list of destinations with cheap flights?

8 Mockups

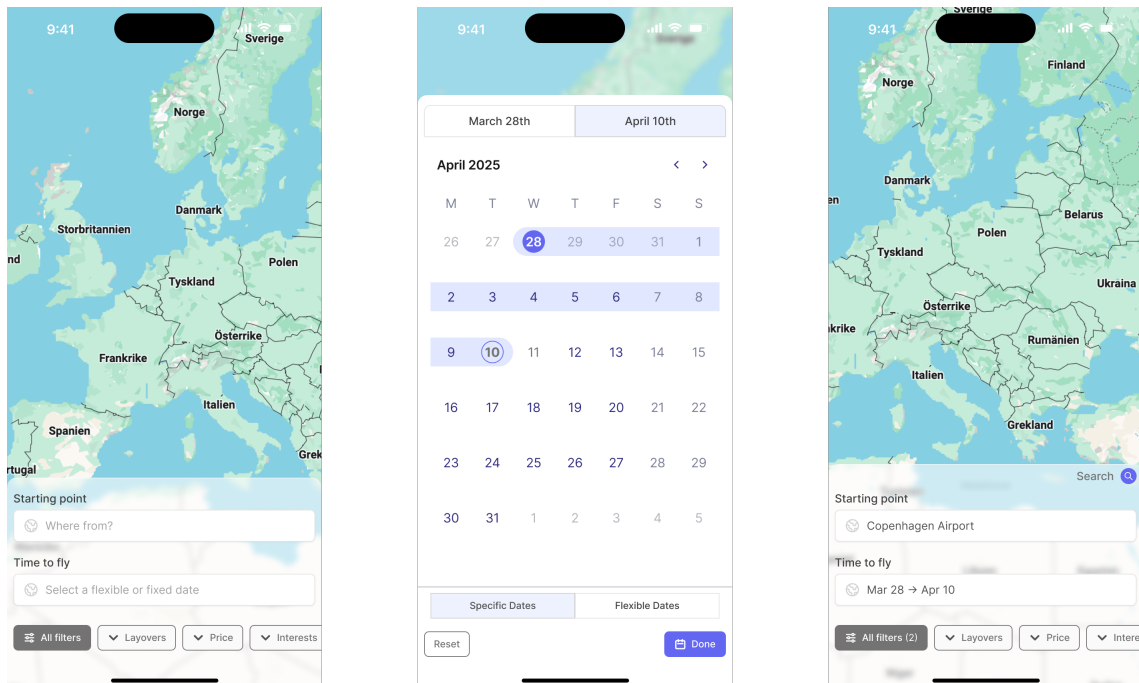


Figure 1: User interface showing the search page, dynamic date picker and filters.

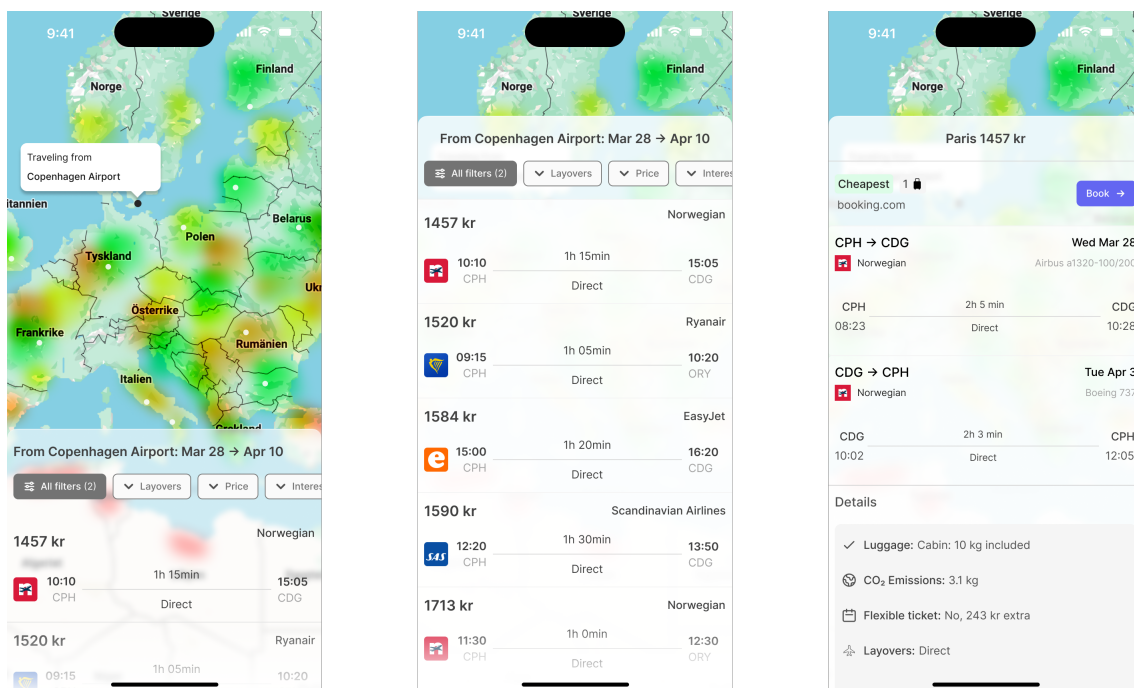


Figure 2: User interface showing the search results page with a list of flights and a heatmap.