Rejsekort & Rejseplan A/S

Background information for suppliers

EXPECTED TIMELINE FOR THE RFI

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Expected Timeline for the RFI

Activity	Time estimate
Public announcement of RFI	April 13th 2021
Deadline for submitting finished questionnaire	April 26th 2021, 12.00 CET
Announcement of who will be chosen for dialogue meetings	End of April 2021
Dialogue meetings	During May 2021
Publishing of findings on Rejsekort & Rejseplans website	June-July 2021

CORE SERVICES

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Core services

The core services provided to the customers* and end-users of Rejsekort & Rejseplan A/S can be divided into three main categories:

Rejsekort

A. Payment

B. Right to travel

C. Validation systems

D. Control systems

Rejsekort is an electronic ticketing system for travelling by bus, train, and metro.

Rejsekort unites the different transport operators, travel zones, ticketing systems, and discount schemes into a common system, which makes it easier for passengers to use public transport services in Denmark.

Rejseplanen

1. Trip search

2. Price engine

3. Live trip updates

4. Plan data

The mission of *Rejseplanen* is to make it easier for users to access timetables and information about public transport in Denmark.

This includes information about traffic, travel itineraries, timetables, tickets, prices and other transport information. Rejseplanen seeks to ensure that the information on the website and in apps is complete, accurate and up-to-date.

Rejsekort & Rejseplanen

Revenue allocation

Rejsekort & Rejseplan A/S receives payments from end-users and is responsible for allocating the revenue between the customers according to where the payments are generated

*Mobility providers connected to the platform

Services – Rejsekort

Rejsekort & Rejseplan A/S provides 9 primary services to its customers* and end-users

Main services

The primary services necessary for completing a journey

Supporting services

Handling and administrating data, agreements, media etc. That support the main services

Administration

Ongoing maintenance and operations of the system and infrastructure.

A. Payment

- Online payment (CWS)
- Automatic payment (refill)
- Vending machine
- Self-service and customer center
- Payment and collection

B. Right to travel

- Provide a physical Rejsekort
- Analogue ticket
- Rejsekort e-wallet
- Subscription products
- Education discount

C. Validation systems

- Card reader (check in/check out)
- App for checking in/out
- Rejsekort status app

D. Control systems

- Opportunity to conduct ticket inspection throughout any trip
- Opportunity to post control (fraud analysis and management)

E. End-user contact

- Creating, maintaining, and terminating users
- Customer service via phone and email
- Automatic mail system

F. Ticket media and payment

- Creating, maintaining, and terminating Rejsekort
- System for cash-payment in busses
- Revenue distribution between traffic companies
- Handle excess liquidity

G. Tariff system and price calculations

- Guidance and updating of existing tariff systems
- Price calculations based on pricing structure from Rejsekort and Rejseplanen

H. Data & statistics

- Trip data via portal-solution (Infoweb and Visual Analytics) and data transfer (FTP)
- Validation of missing check-out
- Reporting, analysis, and statistics

I. Systems operations & development

- Operations is outsourced to Thales, who are monitoring through their own software and hardware
- Monitoring and reporting
- IT-development of product portfolio through demand management and project prioritization (ServiceNow)

*Mobility providers connected to the platform

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Services – Rejseplanen

Rejsekort & Rejseplan A/S provides 7 primary services to its customers* and end-users

Main services

- Rejseplan to end-user via web, iOS, and Android (1, 2, 3, and 4)
- Rest-API to traffic companies (1, 2, 3, and 4)
- Rest-API without prices to other prices (1, 3, and 4)
- Real time to TUS screens via data feed (3 and 4)

Supporting services

Statistics and data analysis

Administration

Ongoing system operations and development

Collaborate and connect other travel services

1. Trip search

- Address based travelling plan across all public transport, as well as domestic flights
- Opportunity to show other travel services in line with business rules (xMode)
- Map via GPS on app
- Store frequently visited places (e.g home or work)
- Show depature info. at specific stop or station
- Show travel schedule

2. Price engine

- Real time price showing of all public transport trips in whole of Denmark
- The price engine needs to generate prices to single trip ticket, as well as subscription products to all PTO's

3. Live trip updates

- Collection of reported live departure times for bus, metro, and trains from all PTO's, including possible delays or changes
- Show reported live times on app and web
- Send push notification to users who have chosen to follow a trip
- Live updates on TUS screens at all locations

4. Plan data

- Collect and quality check of trip schedule from traffic companies
- Release of searchable trip data in Rejseplan
- Release of trip data (without live update) every 14 days in GTFS format to Google, Apple, etc.

5. Statistics

- Search history allows for the opportunity to analyze statistical data such as, geography, travel plan, switching stops etc. (not fully implemented)

6. System operations and development

- Monitoring and reporting (the operations is outsourced to Hacon who monitors software, servers, etc.
- IT-development of product portfolio through demand management and project prioritization (ServiceNow)

7. Connecting other travel services

- Partnership with other transportation providers, connection with Rejseplanen, as well as operations and development of other transportation providers

*Mobility providers connected to the platform

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FRAMEWORK CONDITIONS THE DANISH TRANSPORT SYSTEM

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THE DANISH TRANSPORT NETWORK

In the Danish public transport network, several transport companies are responsible for the ticket revenue and for managing and operating transport services. By the submission of Bill L206 a main target is to meet the end-users with one collected mobility service. In the following you will get a brief description the framework conditions that are mandatory to take into account when delivering mobility as a service to the Danish transport network.

In the context of inspection of a Rejsekort, a transport operator network topology is composed by of number of elements that are used to describe both the geographical topology of the network and the operator transport services network. These elements are briefly described in the following pages.

In the context of journey planning Journey planning is done through a search algorithm that will have to take both business rules and different transportation modes into account.

Business rules shall give Rejsekort & Rejseplan A/S the opportunity to configurate travel guide suggestions, based on business rules.

The Danish transport system - Journey planning

Journey planning is done through a search algorithm that will have to take both business rules and different transportation modes into account

Transportation modes

Business rules

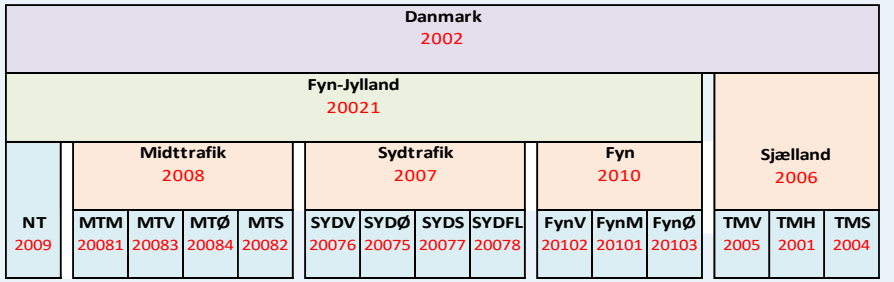
	Traditional mobility services	Other mobility services
Types of transportation	• Train • Metro • Bus • Ferry (Harbor shuttle) • Light rail system • Domestic flights	• Demand Responsive Transport, e.g Flextrafik • Carpooling • Bike sharing • Car sharing • Scooters
Characteristics	• Fixed places for departure and arrival • Fixed Timetables • Unlimited capacity • Can be plan far ahead	• Random places for departure and arrival • No timetables • Limited capacity • Only here-and-now planning
Dependencies	• Geo-data and Stop-placement data • Zone structure and tariffs for price calculation	• Geo-data locating units

Opportunity to configurate travel guide suggestions, based on business rules, for example:

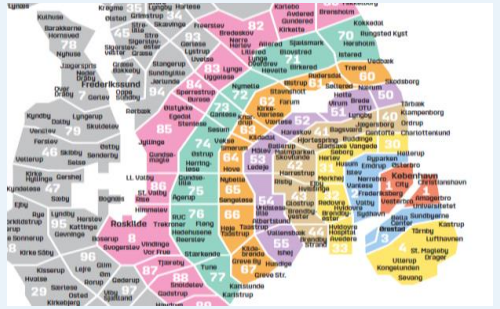
- Number of routes/travels shown
- Prioritize importance of number of shifts vs travel time
- Rules around walking distance
- Rules around choice of transportation mode
- Take travel restrictions into account
- Etc.

Rejsekort – topology

1/2

Topology	Description	Illustration
Stop point	The **Stop Point** is the basic and smallest topologic entity needed to define the network**.** A stop point is defined in the system by its GPS coordinates and its size (radius). A stop point is attached to a single **fare reference point.**	
FARE REFERENCE POINT	Another topology entity is the Fare Reference Point, which is a Fare location, i.e. the fare calculation smallest entity. A fare point is a group of stop points, e.g. located on a station or at crossroads A fare point is defined in the system by its GPS coordinates and its size (radius). A fare point can be attached to several **zones** but must be directly attached to a single **fare authority area.**	
FARE AUTHORITY AREA DEFINITION	A fare authority area (or domain) is a geographical area managed by a Fare authority, and with a common set of fare parameters and rules (fare set). A fare authority area is defined as set of fare reference points, zones, and possibly other fare authority area. Fare authority areas are used to: Calculate a price Check and/or limit geographical validity of a Season Pass product.	

Rejsekort – topology
2/2

Topology	Description	Illustration
Zone	The topology of the REJSEKORT system transport network is based on zone decomposition. These zones are organized in a grid. The network looks like the following example Zones are used to: • Calculate a price in a zone based fare system • Define the geographical validity of a Season Pass product. A zone is defined as a set of fare reference points.	
Zone-group	A **zone-group** (or **maxi-zone**) is a set of zones. They can be used for the definition of the geographical validity of a Season Pass product.	
LINES	The topology of the transport network is based on **Lines** decomposition Lines are used to limit geographical validity check. The definition of entities according to line decomposition is the following: A **service pattern (or service journey)** is a set of ordered stop points where the vehicle (bus, train, ferry...) will successively stop during its service. A **line** is a set of service patterns. For example, for the same bus line, it is possible to have an omnibus service (service pattern will contain all possible points of the line) or an express service (only some main points will be served by the bus). A **Trip** is a single departure to one service pattern and one day type. Trip concerns only bus lines definition.	

Overview slide

Supplier capability threshold to meet the needs of the platforms Rejsekort and Rejseplanen

Rejsekort

- Number of end-users:
  - 3.1 million active travel cards
  - 1.1 million active top-up agreements
- 420 million annual transactions
- 4.2 billion DKK annual turnover on behalf of PTA's
- The legacy system includes 19.000 validation points for check in/check out distributed all over the country and covering both fixed positions at stations and onboard equipment (buses)
- 99.9% System up-time

Rejseplanen

- 4.5 million downloads (4th most popular App in Denmark)
- 1.2 million daily searches by end-users (App and web)
- 0.6 million daily calls to the RP Rest-API
- System up-time 99.9%

Reference year: 2019

AS-IS SYSTEM LANDSCAPE

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System landscape of Rejsekort

Rejsekort

External systems

Connection to external systems (mainly to validate users)

Cloud hosting

host CUV, open API, front-end Rejsekort.dk, and run tests of Rejseplans set up.

Data warehouse /BI

analyses the collected data and sends the results back to the respective product systems. It sustains operations tasks such as, calculations of revenue streams, handling of excess liquidity, validation of cards not checked out, fraud analysis, and (re)calculation of trip costs.

Admi. systems

Systems for supporting daily administrative operations

CRM system

Sales management system

API

central aspect of Rejsekorts system landscape, which makes it possible for the core platform and Rejsekorts edge systems to integrate with each other.

Core platform

platform makes up Rejsekorts systems central functionality, which includes collecting data from decentralized equipment. The core platformis made up of multiple appllications that are:

- responsible for the card-focused setup
- responsible for debtor bookkeeping
- monitoring the system (in the process of being replaced by TAPS
- The self-service system
- The service solution

Hardware

The decentralized equipment, which makes up the primary contact points for users on a trip for example cards and card scanners and vending machines

Website and apps

Customer touch point. Focused on adding value to users' Rejsekort
Including an independent solution for registration of missing check out of Rejsekort

Independent systems

independent solution for issuing and administrating subsidized period cards; school card and youth card. Supports both, ordering subsidized Rejsekort and ordering period cards on other systems

Utility systems

Fraud control system and Geographic validation and selection system

System landscape of Rejseplan

Rejseplan

External systems

Connection to external systems

Data convertion and transport modules

In Rejseplans system landscape, there are a series of integration points, scripts, and other modules for converting data to the necessary formats. The transportation of data goes through Rejseplans systems landscape, the correct internal and external systems, as well as administration. These modules are focused on trip schedules and real time data, to plan updates.

Analysis tools

Statistical data, collected through various user interactions

CRM system

Sales Management system

API

Rejseplans API gives access to Rejseplans data. The API is not used internally in Rejseplans channels but is made available to externals who wants to make use of Rejseplans trip information. With the API, one has access to different functions in Rejseplan, such as trip calculations.

HAFAS (core platform) AWS

The core platform delivers information on timetables and creates connecting trips for users. Furthermore, it incorporates the zone based price calculation engine, a module for presenting alternative transportation options and non-zone-based price calculations, a module for SMS text updates, and lastly, the a module for supporting BAT ticket sale.

Data archive

Storage of historical data from various aspects of user interactions

Website and apps

Customer touch point, including self-service and information on trips, delivered on website and in mobile applications

Notifications system

Complimentary service to help customers

Utility systems

Back-end delivers:

- data and calculations for the geographic interface for selecting zones when buying a period cards.
- Map module with underlying geographic data, as well as other types of data that can help calculate the cost of trips for users
- map module, which delivers zone polygamies – the two-dimensional figures that acts as a barrier in-between zones
- Personalized Rejsekort prices