OptiFlow
Product description

Short title	Product description OptiFlow
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1   Product objective

OptiFlow is an innovative and easy-to-use web-based application that revolutionizes the planning and optimization of routes. With its powerful algorithms, it allows the user to minimize the total logistics cost. The application offers the flexibility to customize cost drivers for each vehicle and order type, ensuring that the optimization aligns with the specific business needs.

With its user-friendly interface, OptiFlow empowers transport planners by providing a comprehensive and easy-to-understand overview of all orders, routes and vehicles. If changes need to be made, OptiFlow offers manual adjustments and suggestions for any orders that cannot be placed on a route.

OptiFlow enables tactical exercises, as the speed of the algorithm allows the user to create multiple variants of one plan. The application optimizes and assigns orders to vehicles in a cost-efficient manner, delivering faster results than traditional methods. Each variant plan can be evaluated and compared, so the user can apply new insights to further optimize operations.

OptiFlow is designed to meet the demands of modern logistics, as it runs on the cloud, eliminating the need for additional server infrastructure. This cloud setup also enables quick scaling of orders, vehicles, and plans.

With OptiFlow, clients have reported validated transport cost savings. The bigger the optimization problem gets in terms of orders & vehicles, the bigger the cost-savings that can be obtained.

As OptiFlow aims for automatic planning instead of manual planning, it not only saves money but also saves time, freeing up transport planners to focus on more strategic initiatives. The application is a valuable tool that empowers transport planners to focus on what really matters and play a more analytical role in the process.

With OptiFlow, smart decisions are made that drive sustainable business growth.

2   Product description

2.1   Product scope

The scope of displayed and usable functions depends on the subscribed product packages and add-ons.

2.2   OptiFlow Match (Route optimization module)

2.2.1   Map and map material

Maps

The interactive digital map showcases order details (including the pickup and delivery points), designated routes, and vehicle starting locations such as depots and sites.

Geocoding, distance matrix calculation and routing are based on the acquired map material and country combinations.

The following features can also be incorporated into the map:

- Integration of search graphs for expedited calculation of distance matrices.

Geocoding

Upon uploading orders and vehicles, all addresses are thoroughly checked for accuracy and completeness through a 'resolved address score' system. OptiFlow leverages Bing and Google Places for geocoding purposes, with each geocoded address receiving a score ranging from 0 to 9. The quality of geocoding is determined by assessing the variance between the resolved and original (uploaded) addresses, with higher resolved address scores indicating more accurate geocoding. This approach empowers OptiFlow users to make necessary adjustments in cases where addresses may be incomplete or incorrect.

The end user can choose to keep geocoding on in the external source systems. In that case OptiFlow will plan based on Latitude and Longitude coordinates provided.

2.2.2 Overview of Plans

An overview of historical OptiFlow plannings is available, as a starting point for the user to re-use, delete, copy, export, and filter the plans.

2.2.3 Orders

Existing order sets can be re-utilized, or a new set can be uploaded as needed. Users can remove, copy, merge, export, and filter order sets, which contain a list of individual orders. The order list can be customized through column header changes and filtering options. In addition, individual orders can be selected for editing, removal, or copying, with bulk editing also available. The information regarding orders includes their location, timing, capacity, properties, and other relevant factors.

2.2.4 Vehicles

Vehicle management in OptiFlow is similar to that of orders, with a vehicle and its allocated driver forming a single unit. The information regarding a vehicle includes the driver's name, start and stop locations, depot information, driver timings, vehicle capacities, cost parameters, route properties, break settings, and other relevant details.

2.2.5 Settings

After selecting the order and vehicle set to use the fourth tab will ask you to select the setting you want to use for your planning. If you skip this tab the settings you selected during your previous run will be applied.

The user can configure basic and advanced settings in the application.

Basic settings

- Labels: Labels are - as the name says - labels that can be added to a plan. These labels are sequences of characters. Labels that are set in the basic settings tab can be shown in the Home tab. Labels have no impact on the planning at all, they are optional and can be used for filtering purposes in the Home tab.

- Description: Like labels, the description field is optional, has no impact on the planning, can be shown in the Home tab and can be used for filtering purposes in the Home tab to

filter on plans. Unlike labels, the description field is a text field. It's no list of separate labels.

- Set a <u>runtime</u>, i.e. the time allowed for OptiFlow to create and optimize a planning. There is a chance the solution could be improved if we let it run a bit longer. Therefore there is the option to continue the optimization once the initial run time has exceeded. This can be done by clicking Play in the status bar.
  When you're not sure about the runtime you've given to OptiFlow, monitoring the KPI's on the Optimization Progress Chart can give you a valuable hint.
  If you notice that, after a certain amount of time, the status of the KPI's stagnates, your runtime is probably long enough. On the other hand, should the KPI's still be improving, allowing a longer runtime might be interesting.

- Select a <u>speed profile.</u> Depending on your account one or more speed profiles will be available. Select the one you want to use, but take into account that only 1 speed profile can be selected for all vehicles in the planning.
  (Please note that we are not using a fixed speed to calculate the drive time. The drive time depends on the speed profile, which is a combination of multiple inputs such as maximum speed, average speed and route-specific characteristics like turns and intersections.)

- The <u>speed correction factor</u> can be used to decrease or increase the drive time of all vehicles within a planning. This is the factor by which the drive time of the planning gets multiplied. There is no impact on traffic time.

Advanced settings

In the advanced settings tab, these advanced parameters can be configured:

- Break Settings: describe which time intervals must be planned between two breaks. OptiFlow provides several predefined breaks rules, but you can customize the break rules yourself based on Work and Drive Time.
- Traffic: take historical traffic data into account or not. Traffic being enabled depends on the chosen Speed Profile (see above)
- Consecutive location restriction strategy: limits certain locations to be reached from far away regions. This helps the routing server to limit memory usage and might be required for large order sets.
- Clustering mode - diameter penalty: is a function to penalize stretched out routes. This results in compacted routes in certain regions.
- Additional handling: a half loaded vehicle can, in theory, load other orders. But this might block the unloading of the orders already in the vehicle. With the Additional Handling feature, the user can limit the number of pickups when the vehicle is still loaded with Delivery-orders.

2.2.6   Planning KPI's

When establishing a new plan in OptiFlow, the planning tab provides an outline of the chosen input data and settings. The initiation of the OptiFlow plan can be conducted from this tab.

Throughout the optimization phase, this tab displays significant planning KPIs, such as cost, objective, the total distance, the number of unplanned orders, among others. This feature enables the planner to keep track of the planning process.

2.2.7   Plan board

The plan board provides a comprehensive overview of all scheduled routes, in either time-dependent or static view mode. The user can inspect and validate planned routes, by relying on diverse route properties and KPIs that can be used to sort the routes. The plan board enables the user to make modifications to the planning, such as introducing new vehicles, locking orders or routes, or to rearrange orders through drag and drop.

2.3   OptiFlow PowEr mode

PowEr is a cutting-edge add-on, featuring a new optimization engine that replaces the standard one. It enables multiple parallel optimizations and intelligently rotates the problem across high-performance engines for maximum speed.

This innovative optimization method, combined with its boosted infrastructure, results in significantly faster planning times, reducing the workload for planners, meeting tight customer and production deadlines, and allowing for quick scenario planning during exceptions.

This trailblazing optimization technique has led to unparalleled cost savings at our clients.

2.4   OptiFlow Orderbook (Order management module)

2.4.1   Orderbook value proposition

- Real-time connection with the order generation system

- Avoid user errors and redundant manual data entry

- **Centralized** overview of all the order information relevant for planning

- **Productized** tools instead of home-made tools for Excel manipulation

- **Automated enrichment** of source orders with data
  specifically needed for achieving **more savings from the optimization**

Orderbook is always populated from an external order generation system via REST API. Orders are not created or updated by end users in OptiFlow Orderbook.

Note:
If features are needed which are only available using excel import, then OptiFlow Orderbook cannot be used. The feature-fit analysis is conducted during the as-is/to-be project phase of the Maturity Grid.

2.4.2   Orderbook transport requests

Orders can be grouped administratively into Transport Requests. This grouping in Orderbook has no impact on the optimized routes in OptiFlow Match.

2.4.3   Orderbook orders

The user can set the order type, a pickup or delivery to/from the depot, or even both Pickup and Delivery in the field.
This order has properties such as its capacity, execution time, and requirements on driver/vehicle.
At the creation of an order it can be linked to other Orderbook concepts such as Site Locations or Companies. See below. This will enrich the order when it flows to the Match module

2.4.4   Order enrichment for optimization

Orderbook conditionals

Orderbook conditionals are a system of customer specific rules to automatically change the source orders.
Via Orderbook conditionals, you can enrich the source orders with optimization-related data. This relieves the external order generation system from the responsibility of collecting and maintaining data only pertaining to route optimization.
The condition: the condition determines which orders the rule will apply to. Conditions include orders of a certain category, orders for a certain location, orders within a date range, or orders for a specific client.
The rule: The orders corresponding to the condition will be enriched automatically to ensure maximum information for the optimization strategy. Enrichment options include changing the time windows or restricting which vehicles / drivers can be assigned to the order.

Orderbook Maxtimeinvehicle

The maximum time in vehicle rules can be configured in Orderbook.
The maximum time limit a passenger can be in a vehicle is **automatically calculated** in Orderbook for each order received via API, based on the customer configured multiplier of the automatically calculated a-b time of the pick-up delivery. Different rules can be created for different types of orders. The rules are applied (or not) based labels on the order.

Orderbook site locations

Locations can be managed in Optiflow to facilitate managing rules or properties which relate to many orders for a single location. Using location management is optional; a lastmile planning which rarely has recurring locations would not require defining the locations in Optiflow.
Location information can be managed in the Orderbook application, such as
   -    Address and planning address
   -    Open and closed times
   -    Requirements and restrictions
   -    Fixed Stop Time at the location
At the creation of an order, this new order can be linked to the known location. At that point, the user has the possibility to use or override the default order characteristics with the optimization specific location properties from Optiflow.

Orderbook companies

Companies can be imported or configured in Orderbook. When an order is created, this order can be linked with the known Companies as the order 'Client'.

This can be used when creating Conditionals (see above).

3   Deployment Scenarios

3.1   Data flow and data input / export

OptiFlow platform supports machine-to-machine integration through public REST API endpoints for some functions. The integration process relies on asynchronous communication, with each component responsible for correctly processing and retrying messages as necessary.

3.1.1   Input of data

Order input via excel

Orders can be input by end users into OptiFlow Match in excel format.

Order ingestion via REST API

Orders from the order generation system can be ingested in the OptiFlow Orderbook module via REST API. Orders can be grouped administratively into Transport Requests; this grouping in Orderbook has no impact on the optimized routes in OptiFlow Match.
Our orderbook API contract:

- https://developer.conundra.eu/orderbook/

3.1.2   Creation of a plan and initiation of the optimization

An optimization is started by an end user in the OptiFlow Match module.

3.1.3   Export of a plan

Export by end user

The end user can export the plan in excel format.

Planning REST API

The optimized plan is available for downstream systems via a REST API endpoint.
Our planning API contract:

- https://developer.conundra.eu/planning

3.2   Deployment Scenario 1

User initiated excel input for orders and vehicles, user initiates and reviews the optimized routes, user triggered excel output of optimized routes
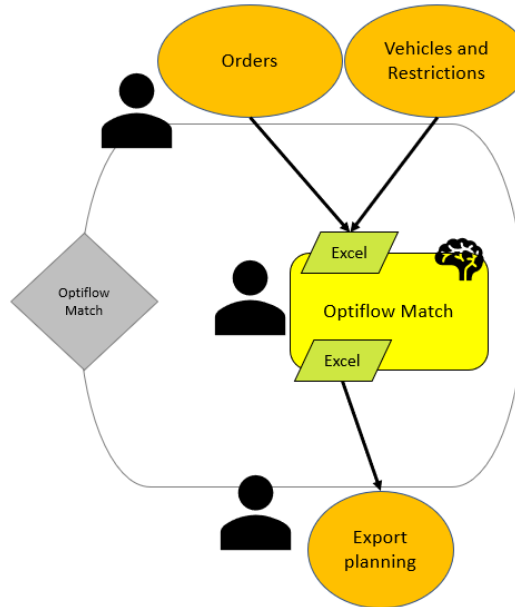Components involved:
- OptiFlow Match

Figure 1 Scenario 1: OptiFlow Match

3.3   Deployment Scenario 2

User initiated excel input for orders and vehicles, user initiates and reviews the optimized routes, user triggered or timed polling from downstream component using REST API GET request to retrieve excel output of optimized routes
Components involved:
- OptiFlow Match
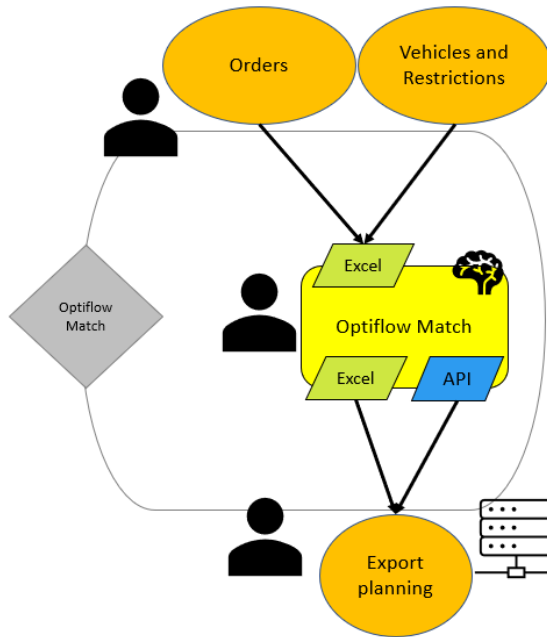- OptiFlow Match Planning export API

Figure 2 Scenario 2 OptiFlow match with output in excel via REST API

3.4   Deployment Scenario 3

Orders input via API, User initiated excel input for vehicles, user initiates and reviews the optimized routes, user triggered or timed polling from downstream component using rest API GET request to retrieve excel output of optimized routes
Components involved:

- OptiFlow Orderbook via API (Order management module)
- OptiFlow Match
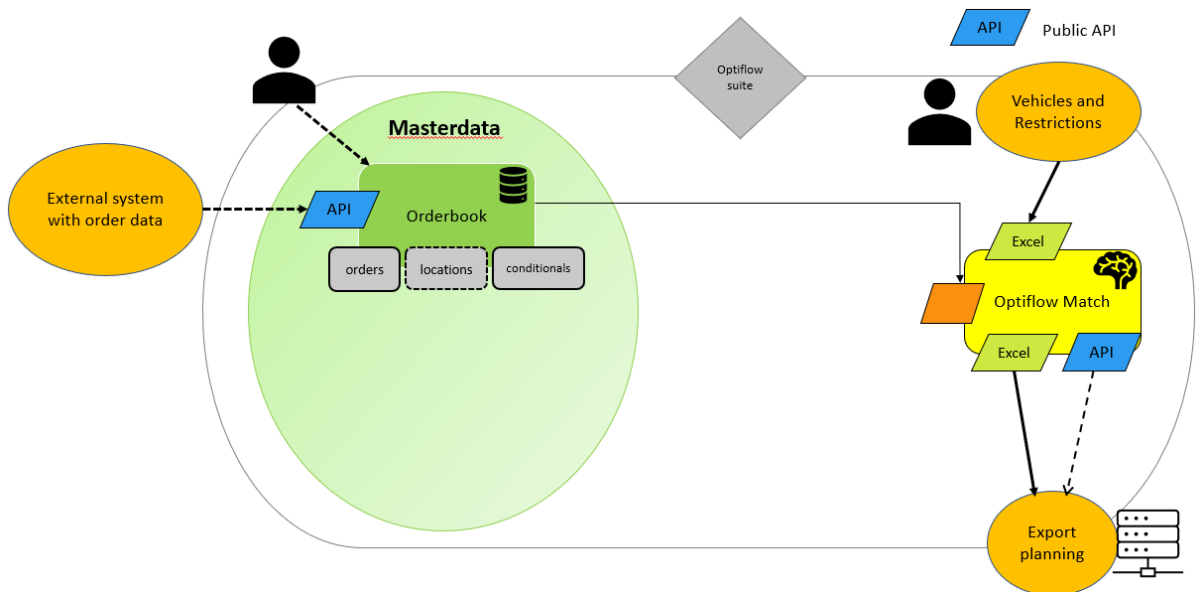- OptiFlow Match Planning export API

Figure 3 Scenario 3 Orders input via REST API

4 Technical system description

4.1 System requirements

PTV OptiFlow can be used as a web client and is recommended to be used with the Google ChromeTM web browser on a desktop computer.

Functionality and layouts from untested web browsers and operating system recommendations can vary. The Service Description is not an assurance of a claim to all variants.

- Browser: Use the latest version of Google ChromeTM or another Chromium-based browser.

- Client configuration:

  - Network bandwidth: recommended connection speed 20 Mbps or more

  - Screen resolution: 1600 x 900 (high color quality) or higher (1920 x 1200 recommended)

4.2 Functional limits

Plan size: (Maximum number of orders in a single plan)

- Plans with more than 9000 orders are not supported with our default OptiFlow Match license.

Data retention:

- Standard data retention period for plannings is limited to 24 months. After this period the data may be deleted. Those periods might be subject to change or agreed upon in the individual subscription contract.

4.3 Available program languages

OptiFlow Match
- English
- Dutch
- Czech

The accompanying online user manual is provided exclusively in English.
Language and units of measurements: English (US) language and US units of measurement are NOT available in this version.

Administrator users (Orderbook)

Orderbook is currently available in English only.
The API documentation and contracts are provided in English.