



# kodergarten

## PTAM Route Planning & loading list enhancements

Document Subtitle

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#### Introduction

One of the most time consuming tasks in managing the provision of transport for education is designing and maintaining the transport network. Changes to the network need to be disseminated to learners and transport operators. Optimising the network can result in significant savings. The PTAM Route Planning module provides a collection of tools that helps perform this process efficiently.

Operation of these tools require some additional data.

For learners we require their entry and exit points from the network. This could be one of:

- Latitude / Longitude of their address
- Their address which will be GEOcoded. The address itself will not be stored on PTAM.
- The stop point code where they enter and leave the network.

We also require data that would confirm the learners enrolment to an educational establishment. We understand that this element of the enrolment process is being worked on by Powys Dev team.

Using these tools it is possible to create a network of connected services to and from education establishments. Entitled learners can be assigned to these services to create vehicle loading lists. These services will be operated by transport providers under contract.

Building a transport network is an iterative process. Often not all the information will be available at the beginning and late changes or part of normal operation. Also there may be many stakeholders involved in approving the solution. Also next year planning may be started whilst the current network is being operated and altered.

PTAM is able to maintain two editable versions of the network. One is for the current academic year and the other for the next. Whilst refining a network it is possible to create immutable snapshots that can be shared for review. If a snapshot is deemed acceptable it can be selected as the current network. It is possible to list the differences between two snapshots. This information can be used to uniform parties of changes. For example a learner may have been moved to a new service or to use a different stop point. Alternatively an operator may be informed that there is an extra stop on a journey or the vehicle loading has changed.

## **Assumptions**

- The same journeys are run each day.
- Learners are concurrently enrolled in only one educational establishment.

## **Definition of terms**

### **Direction**

When used to describe a route's direction of travel; inbound means towards the education establishment and outbound is the return homeward bound journey.

### **Entitlement**

A learner is entitled to school transport if they live further than from from the school

### **Establishment**

## **Leg**

### **Service**

A service defines an inbound, outbound or inbound and outbound routes contracted to an operator to convey learners to and from education establishments. Learners may be entitled to use one or more services to travel to their enrolled education establishment .

### **Stop**

A stop defines when a route stops at a stop point. A single route may visit a single stop point multiple times. Each of these visits will be a different stop on the route with a different time.

### **Stop Point**

A stop point defines a place where routes may stop. These can be nationally defined stops identified by NaPTAN ATCO codes, or local stops created only for the use of PTAM.

### **Route**

## **How it works**

The Route Planning module presents a new workspace on PTAM. The most used view is a multi layer map display. You start building or editing a network by adding one or more establishments which then will be displayed on the map. Once we have an establishment any enabled layers will display information relevant to the establishments. This is an establishment focused workflow.

The layers available are:

- Learners
- Route Stops
- StopPoints
- Active route
- Routes
- Catchment area
- Establishments
- Base map

A user can hide and display any of these layers except for the base map. Filters can also be applied to layers to expand or restrict the information displayed. For example the Learners layer can have the following filters applied to display:

- Those enrolled in list of establishments (defaults to establishments added to workspace)
- Those who have not been assigned to a Stop Point
- Those who have not been assigned to a route
- Those who have a problem with their education enrolment

The system is designed to highlight where work is still required so for example learners that have a valid education enrolment, have been assigned to a Stop Point the Learner will by default no longer display but the Stop Point will display an incremented count for learners waiting to be added to routes. Once all the learners at a stop point and Routes that connect to a campus of the establishment they are enrolled in they will no longer display on the map. In this way progress can be seen towards a completed network of routes and loading lists.

## **Inbound / Outbound routes**

A service is made up of inbound and outbound routes. Potentially there may be only one of these but that would mean that the other direction would probably be provided by another service. Unfortunately the return journey from the education establishment is not just the reverse of the inbound route. This is because the stops may reference different stops, on different sides of the road for example. In many cases the routes may run on different roads due to one way streets or other restrictions. This means that in many cases learners will be picked up in the morning at a different stop point than that which they are dropped off on the return journey. Each learner can be allocated an inbound and an outbound stop point, oftentimes these will be the same.

A user is able to switch the map view between focusing on the Inbound and Outbound route network.

## **Layers**

### **Base Map**

The base map displays the road network. Tools are provided to pan, zoom and find locations by Lat/Long and stop point. No facilities are provided for editing the base map.

### **Establishments**

The establishment campus layer can display selected establishment campuses. Establishments can be added and removed from the workspace so it is possible to work on multiple

establishments simultaneously. An establishment detail panel can be opened which contains details of the establishment. It is also possible to associate stop points with an establishment campus.

### **Catchment area**

The catchment area layer simply displays the catchment area for free transport for an education establishment. This depends on the inner and outer area limit polygons being provided for the establishment. There is no capability to modify the catchment area. Note that future iterations may offer auto generation of the catchment area using iso-distance calculations and modification by editing the catchment polygons. Catchment areas can only be displayed for establishments that have been selected for display. A tool is supplied to turn this layer on and off.

### **Routes**

The routes layer displays routes on the map. By default all the routes for the selected direction for the establishments currently added to the workspace are displayed. The user is able to add and remove arbitrary routes from the map as required. Selecting a route will display the route details panel from where editing the route can be initiated. The route detail panel shows:

- The service details
- The timings and stops for the route
- The learners currently associated with the route

It is possible to turn on the display of the expected loading of each leg of the route.

### **Active Route**

The active route layer is only displayed when a route is selected for editing. The route is then highlighted. Only a single route can be edited at a time. Creating a new route automatically selects the route for editing. The active route details panel allows the following actions:

- Add/remove and reorder stops.
- Set stop timings (default travel times are automatically created)
- Show Stop arrival and Stop Departure time and a duration between the stop points. If a stop is added to a service and arrival/departure and duration are entered all subsequent stop times for that service will be updated.
- Create connections to other routes
- Generate tracks
- Associate stops with establishments

### **Stop Points**

Stop points are defined places where a service vehicle may stop. These can be NaPTAN stop points or locally defined PTAM stop points. A tool is provided to create new local stop points. Stop points can be configured to display the count of learners using this stop or the count of learners that have not yet been allocated a route (default).

- Only Stop points that have associated learners
- Only Stop points that have associated learners not assigned to a route
- All stop points

Selecting a stop point opens the stop point details panel. It displays the location name and lists the learners using this stop point. Learners associated and dissociated from the stop point.

The stop point layer can be hidden if required to help focus on defined routes.

### **Route Stops**

The route stops layer simply displays the route stops.

### **Learners**

The learners layer displays learners' home location on the map. This helps associate learners with stop points where they can connect with inbound and outbound journeys. Learners can be filtered to allow the user to focus on what is still to be done. By default only learners enrolled to establishments selected into the workspace are shown. The learners are displayed differently for the following states:

- Allocated stop points
- Associated with routes/services.

The filters are:

- All learners
- Entitled Learners (learners who are entitled to school transport)
- All Learners associated with selected establishments
- All Learners associated with selected establishments
- All Learners not allocated stop points
- Learners not allocated routes/ services

The map view does not display learners who are not enrolled in an establishment.

### **Revisions and snapshots**

In order to ensure that when changes are made and committed/saved we need to lock the network of routes and services at that point. This means that if there is a requirement to roll back to the previous snapshot of the network it can be done quickly

## **Connecting services**

Some learners will be required to use more than one route to travel. This may be feeder services that collect learners and drop them at a stop point to connect to another service. In this case the feeder service terminates at the connecting stop. Alternatively they may leave one longer running service to join another. The main feature that distinguishes feeder services is that they don't directly connect to any education establishment. As a consequence these feeder services won't be added to the map view until the connections have been entered.

We make connections at the route stop level. This associates the connection to a place at a time. These connections may not always be made at the same stop point. The connections can be made by editing a route's stop.

The connections can be used to build the route network connecting to an establishment. This information is also used to calculate vehicle loading.

## **Calculating Vehicle Loading**

To calculate vehicle loading the system splits a route into legs. A leg is a section of a route where learners only get off the vehicle on the inbound journey or get off on a return journey. We can do this as we only need to calculate the maximum loading in any section. Once journeys have been split into legs and learners allocated to the journey legs the expected maximum loading for a leg is simply the sum of learners allocated to travel on that leg. A similar process can be done to calculate actual vehicle loading for a single vehicle journey by using the scan data for that journey.

In order for vehicle loading to reflect reality of the service provision, contracts for services currently require that a service has a contracted capacity - the provision for entering actual capacity against the service is required (which can be more or less than the contracted). Loading list would be measured against Actual Capacity. There is no provision for multiple vehicles i.e. two smaller vehicles.

## **Tabular views**

In addition to the map view there are a number of other views to help in the production and maintenance of route networks.

- This would initially include for:
- a more traditional timetable view of a service
- Learners against stops
- Learners against establishment
- Connected services

## **Automation**

- The Route Planning module provides a number of “auto fix tools” that can be used to automatically resolve simple issues.
- Automatically assign stops points to learners - with ability to edit
- Automatically assign learners to routes - with ability to edit
- Automatically reverse a route - with ability to edit.

## **Multi user considerations**

Initially only one user will be able to edit the network in route planning. This does mean that we need to consider how we deal with scenarios such as where the user who is editing the network of routes has forgotten to unlock the network for someone else to edit.

Edits would be global and always based from the most recent snapshot of the network of routes. Future versions could allow for establishments to be put into groups (or regions) as reflected in the current client spreadsheet i.e. Newtown. Issues would need to be resolved as to an establishment being in more than one ‘group or area/region.

## **Validation tools**

To be discussed with the client.

## **Comparison and difference tools**

Essentially for the client to be able to understand clearly what the changes are between the current and proposed network. Broken down into tabular and map form covering changed services/routes and where loading list is changed - details on this. The objective is so that the person who determines that a proposed network change (for this or next academic year) is good to be made live.

To be discussed with client

