VIPS

Per Bergland
Managing Director
VIPS AB

What is VIPS?

- Simulation tool for transportation systems
- Models the reality
- Public transport tools
- Car network tools

VIPS' History

- VIPS was created by Volvo Bus/VTS in the beginning of the 80's
- Currently in its third generation: "VIPS/3"
- Built and marketed by VIPS AB
- Approximately 60 users world-wide, growing

Route Network Planning Objectives

- Best possible use of existing resources
- Minimum impact of decreased resources

Basic concepts

- Travel Demand
- Trip, trip leg
- Generalised cost
- Travel standard

Main application areas

- Evaluation of a combined supply/demand scenario
  - Level of service
  - Passenger loads
  - Performance
  - Required resources

Modelling the input

- Route Network Model
- Demand Model
- Assignment Model

The Route Network Model

- Physical Data
- Operation related parameters
- Cost and Revenue related parameters

The Route Network Model

- The model works with average values for ride times, headways etc
- Reduce the size of the network description without loss of important information

Physical Data

- Nodes
- Links and Walk Links
- Segments
- Routes

Nodes

- Node Type
  - Stop
  - Centroid
  - Point
- Convenience attributes

Links and Walk Links

- Link
  - From
  - To
  - Link Type
  - Time
- Walk Link
  - From
  - To
  - Time

Segments

- Building block for routes
- Convenient when many routes have a partly common alignment
- Also for specifying coordination
- Can be disregarded

Routes

- Types
  - Single-directed
  - Double-directed
  - Circular
- Headway
- Layover
- etc

Passenger Related Parameters

- Weights
- Time cost
- Matched transfer times

Operating Costs

- Per km
- Per hour

The Travel Demand Model

- The stochastic nature of the demand implies that aggregated values are stable
- O-D Matrix
  - Stop based
  - Centroid (Zone) based

VIPS Route Network Analysis

- Abbreviated "RNA"
- Simulation process
- Passengers seek to minimise weighted travel time

VIPS RNA Postulates

- Each passenger knows the headway and riding time to the destination for all possible routes from the origin and transfer nodes
- Each passenger has an ideal departure time, and these times are uniformly distributed over the studied time period

VIPS RNA Assumption Choice

- A: Passengers know departure times (“timetable knowledge”)
- B: Passengers do not know departure times

Assumption A or B?

- A passengers that does not know departure times (B)
  - Always boards the next departing acceptable bus
  - If there are several boarding stops, only the one that is best on average is used

Assumption A or B?

- A passengers that knows departure times (A) gets a better service
  - He/she can choose from different boarding stops at different times
  - He/she can choose to ignore a bus at the stop for a later departure of another, quicker, route

Examples

VIPS RNA Assumption Choice

- C: Routes have independent regular departures
- D: Routes have perfectly synchronised (coordinated) regular departures

Asumption C or D?

- In real life, only some routes have coordinated departures
- Assuming perfect coordination (D) is too optimistic
- VIPS allows a combination, with special coding for coordinated routes

Other assignment models

- Pure frequency-based (EMME/2)
- Logit-type (TRIPS, VISUM)

Pure frequency-based

- Equals VIPS assumptions B+D
- Flip-flop effects

Logit-type distribution

- Cannot distinguish between stochastic values (wait time) and fixed values (remaining travel time)

Calibrating (tuning) the model

- Travel Time Weights
- Transfer Penalty
- Local conditions
  - Disutility factor
  - Transfer stops
  - Matched Transfers
  - Mean delay

Evaluation of the route network

- Must always compare relative the base situation
- The modelled base replaces reality

Diagnostic study classes

- Level of Service
- Resources
- Productivity
- Economy

Level of Service

- What is the total travel time?
- How many transfer have to be made?
- How do we get the most benefit from a small improvement?
- How do we get the least impact from a decrease in service?

Resources

- How many vehicles and drivers are required?
- How can the resources be minimised?

Productivity

- Are the vehicles and drivers efficiently used?
- Capacity utilisation
- Cost per passenger km

Economy

- Cost
- Revenue
- Revenues/Cost

Appraisal of the present network

- Very helpful tool: Graphics for loads and accessibility figures

Evaluation of alternate route networks

- Objectives:
  - A: Design a network that provides an unchanged level of service at a lower production cost
  - B: Find a route network that gives the best level of service at a given cost

Evaluation of alternate route networks

- Practical way
  - Follow option A until no further improvements can be found
  - If B is the goal, put resources back into the network where they contribute the most

Option A

- Moderate changes to existing routes
- Exclusion and creation of complete routes

Modification of existing routes

- Headway
- Route Alignment
- Stops

Route alignments

- Examples

Stop changes

- Example

Exclusion and creation of routes

- Choose strategy:
  - The direct trip strategy
  - The feeder strategy
- Final solution is likely to be a compromise due to local conditions

VIPS