Planning of Vancouver’s Transit Network with an Operations-Based Model

Presenter:
Ian Fisher, TransLink

Co-authors:
Wolfgang Scherr, PTV
Kean Lew, PTV
Overview

• Transit planning in Metro Vancouver

• The Regional Transit Model (RTM): Transit data integration and operations analysis

• Model Applications

• Studies performed

• Conclusions and future directions
Metro Vancouver

21 cities

2.2 million residents, 3.2 million by 2040

> 294 million transit boardings (unlinked) in 2007
> 78 annual transit rides (linked) per resident

Major gateway for sea, air and rail freight

> No urban freeways/motorways

Prior to 1999 no regional transportation agency
TransLink’s Regional Transit Model

TransLink Mandate – Integration of:

Public Transport

Regional Cycling

Rational Roads & Bridges

Intelligent Transportation Systems

Transportation Demand Management

Vehicle Emissions Testing
Intermodal Transit System

- Commuter rail (West Coast Express)
- ALRT (SkyTrain)
- Passenger ferry (SeaBus)
- Bus (includes trolleybus)
- B-Line (frequent, limited stop)
- Community Shuttle minibus
Rapid Transit Projects in the Region
Area Transit Plans

- UBC & Vancouver (2005)
- Burnaby & New Westminster
- Richmond (2008/2009)
- Northeast Sector
- Maple Ridge & Pitt Meadows
- South of Fraser (2007)
TransLink’s Regional Transit Model (RTM)

Operational model of the regional, intermodal transit network

Off-the-shelf technology (VISUM)

Integration of existing databases (schedule, bus stops, APC, NAVTEQ)

In-house use of model

Scenarios
  > Optimization: Adjust routes, train assignment and schedules
  > Network extensions (new rapid transit corridors)

Types of analysis
  > Ridership/capacity analysis
  > Vehicle/train use and fleet requirements
  > Cost/benefit analysis

Visualizations and animations that are comprehensible to lay people
Model Components

Supply
- Nodes and links (routable street network)
- Stops (stations)
- Transit lines
- Existing schedules: imported, future: edited
- Vehicle model: consists, blocks

Demand
- OD matrices derived from counts
- Departure time distributions
- Time-dynamic passenger flow model

Interactive Tools
- Mapping, visualization
- Editing, analysis
The Rapid Transit Model – 24 Hour Network

30-minute time-dynamic passenger volumes 2011, colour-coded by v/c-ratio
Comprehensive Operations Analysis: Average Speed
Comprehensive Operations Analysis: Stop Catchment
Comprehensive Operations Analysis: Travel Time

From WF station
Comprehensive Operations Analysis: Travel Time

From MT station (TransLink)
APC Visualization with the RTM
Validation: System Ridership (Unlinked Trips)

- SkyTrain (ALRT) *
- West Coast Express
- SeaBus (Ferry)
- B-Lines
- Standard Bus
- Community Shuttle Bus

Validation: Bus Boardings (Model versus APC)
Validation: Close Replication of Ridership

- SkyTrain boarding 2006 survey
- VISUM model boarding 2007
SkyTrain

> ALRT, driverless, largely elevated
> Backbone of the transit network
> Two lines with combined headway of 108s, split tail operations
> Currently strong capacity constraints during the AM peak
TransLink’s Regional Transit Model

SkyTrain: Contributions to Decision Making

The present operations are optimal with regard to capacity

> On existing network there is no better way to operate with existing fleet

Future capacity of the critical segment WF-BW can be expanded to 220% of today. Assuming:

> Headway reduced from 108s to 90s
> 5-car trains
> Fleet expansion

Fleet Strategy: It is desirable to add 3-car units to the fleet

> Current Mark-II consists: 2-car or 4-car,
> Future: 2-car, 3-car, 4-car, 5-car - maximal options for future operations
> Time-line for future fleet orders

Operational concepts for SkyTrain extensions

> Evergreen, Broadway-West
Application: Evergreen Line as ALRT Extension

Split Tail

Double-Coordinated

Break at CO
w/ CO-LH shuttle & Expo short turn

Break at LH
Application: Evergreen ALRT Operations Scenarios

Performance comparison

> Ridership 2021:
  > Number of transfers
  > Pax km, pax hours

> Operations:
  > Fleet required
  > Car km, train km
  > Car hours, train hours

> Volume/capacity
  > Several segments
Application: Canada Line – Bus Service Adjustment
Conclusions and Future Perspectives

TransLink’s network and ridership is expanding

> The RTM is becoming a key resource

User group of the Regional Transit Model:

> Several staff have been trained; no full-time staff assignment
> TransLink has taken ownership – consultant still helps out with studies and model calibration

Next studies:

> Contribute operations analysis to three major strategic studies:
  > Expo line study
  > UBC rapid transit line
  > Strategic network review
> Analysis of BRT projects
> Area Transit Plans
Thank You

For more information, please contact:

Ian Fisher  
TransLink  
604-453-4670  
ian_fisher@translink.bc.ca  
www.translink.bc.ca

Wolfgang Scherr  
PTV  
302-654-4384  
wscherr@ptvamerica.com  
www.ptvamerica.com