



The Zenith Model

A Brief Introduction

Zenith Version 2.0.0

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The Zenith Family of Travel Models

Zenith models have been successfully utilised in hundreds of projects

Zenith is a travel modelling system developed by Veitch Lister Consulting, which has been used extensively for transport planning in Australian cities and regions. The model builds upon the "four-step" modelling process and is implemented in the OmniTRANS software package. The Zenith models have been successfully employed in hundreds of transport planning / modelling studies, including many of Australia's most important transport infrastructure projects.

The Zenith models are notionally "strategic" models, in that they cover very large regions (our Victorian model, for example, includes all of Victoria). However, the models also include rich detail in their representation of socio-demographics, land uses, travel zones and networks, and are frequently used to support tactical and even operational transport & land use studies.

Zenith models have so far been developed for 8 Australian cities and regions, and include over 90% of the Australian population.

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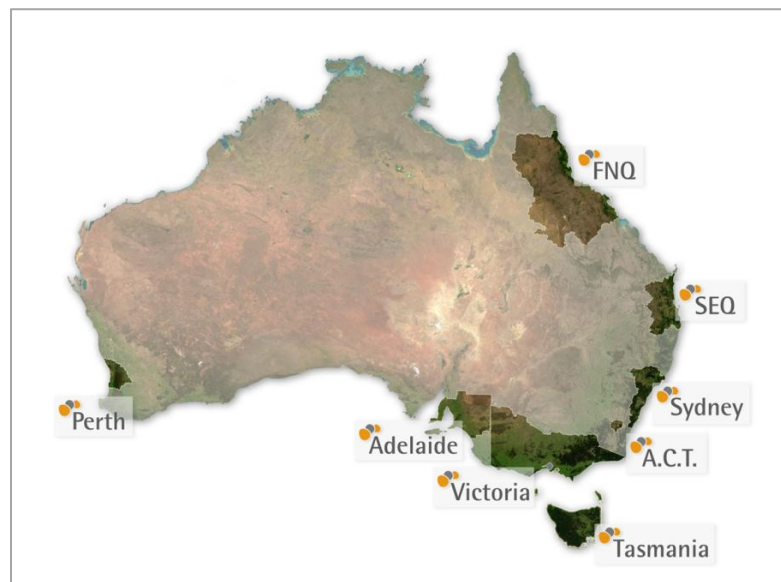


Figure 1 - The 8 Australian Zenith Models



Why Zenith?

There are numerous advantages to using the Zenith system:

Zenith is more than just a model

Zenith is a complete framework, designed to support the entire modelling life-cycle. Zenith includes tools to perform model validation, statistical estimation, demand analysis, data manipulation, economic assessment, graphical image production, and many other modelling related tasks.

Continually up to date

Continually up-to-date

We use the models in house so you don't have to worry about stagnant and out of date data.

Demographics and Land Use

Zenith includes up to date forecasts of small area land use and demographics. Our internal demography and land use team ensures that Zenith models always run with the latest forecasts of small area land use and demographics

Advanced features available in Zenith

Robust modelling of toll roads

- **PT Crowding** – the Zenith model includes the costs of overcrowding on public transport, affecting travellers' choice of destination, mode, route and stop. As a result, the model can be used to assess the likely demand and economic benefit of capacity increasing transit projects.
- **Toll Choice** – The Zenith model has an unrivalled track record of accurately predicting toll road patronage on Australian toll roads.
- **Fully Multi-modal** – The Zenith model explicitly considers multiple access modes to the transit system, including walk access, park 'n' ride and kiss 'n' ride travel. This is important considering the competition between these modes in Australia's sprawling cities.
- **Multi-period** – All Zenith models include at least 3 periods.
- **Disaggregate travel zones** – All Zenith models can be run at sub-CCD travel zones. This is essential in transit studies where accessibility to the transit system is a major factor.

Detailed zone systems
(+10,000)



- **Disaggregate travel market segmentation** – Zenith models include travel made by residents, visitors and freight, segmented by numerous journey purposes and car ownership levels.
- **Broad area coverage** – all Zenith models include a significant buffer area which removes issues related to 'cross-border' flows.

Cost effective

Zenith models benefit from economies of scale, through their application in multiple regions and multiple industries (e.g. outdoor advertising, retail franchising, etc.), and their collaborative development with State Governments and academic institutions.

Complete Transparency

Zenith comes with:

- User guides
- Technical notes
- Video tutorials
- Source code

A full suite of documentation, including user guides, technical notes, and video tutorials is available from the Zenith website <http://zenith.veitchlister.com.au>

It is our intention that all aspects of the Zenith model be open to the user, including all model inputs, outputs, algorithms and model parameters. This policy helps to ensure that model users are fully equipped to respond to all modelling challenges, and abreast of all of the model's strengths and limitations.

Rich Graphical Presentation

Accuracy and reliability has always been the key strength of Zenith model. Today, however, Zenith also delivers rich graphical outputs through the OmniTRANS software package. Examples showcasing OmniTRANS' graphical capabilities are presented on the following pages.

Figure 2 - Crowding on Melbourne's Train Network under 2031 Base Case



Assumptions

The Zenith model has played a key role in developing the Melbourne Metro project. A key feature has been its ability to model the behavioural effects of PT over-crowding, and the likely impact of the Melbourne Metro within a crowded public transport environment.

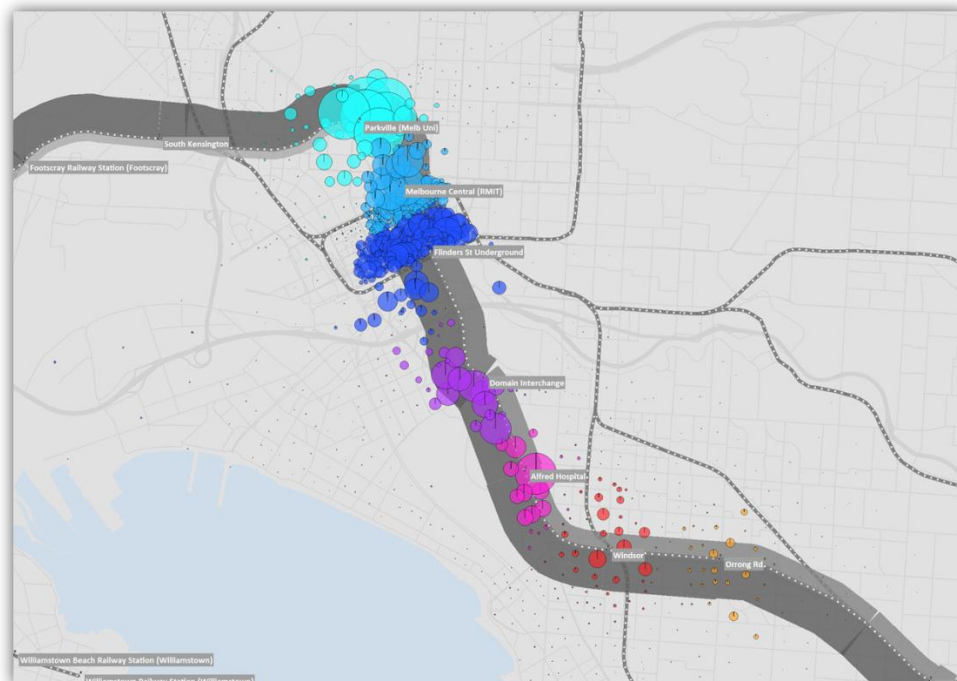


Figure 3 - Catchments for Potential Melbourne Metro Stations

Zenith outputs have been used to design potential stations on the Melbourne Metro line.



Figure 4 - The Spatial Distribution of Benefits from the Melbourne Metro project

Zenith's economic evaluation module has been used to assess the economic benefits of the Melbourne Metro project. Zenith captures travel time savings, reliability benefits, resource cost corrections, vehicle operating costs, greenhouse and other emissions, traffic accidents, and agglomeration benefits.

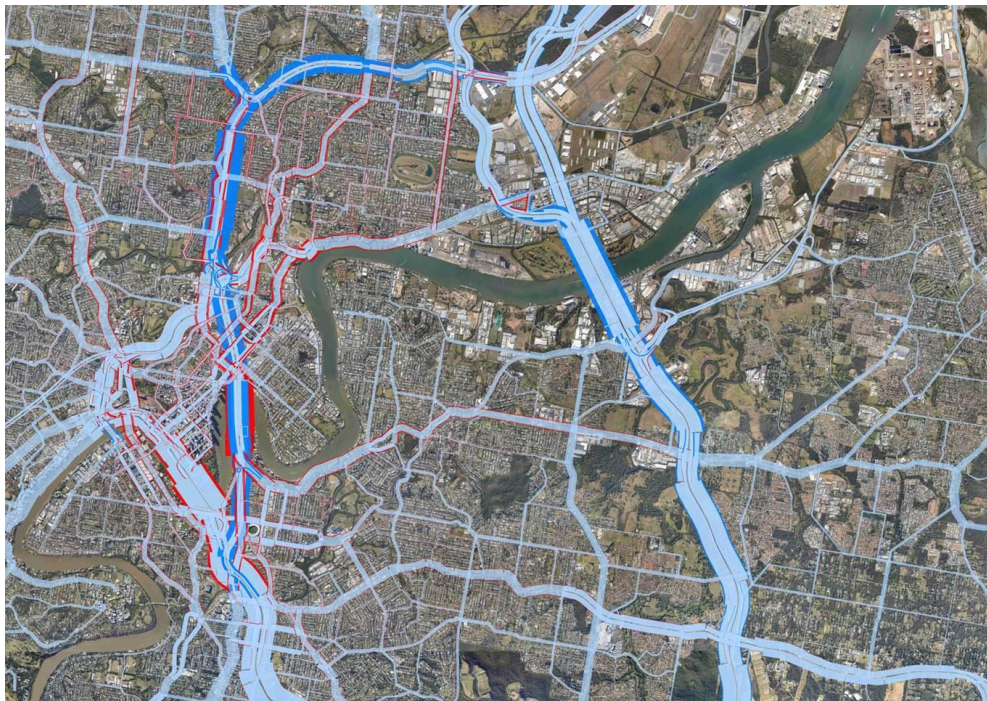


Figure 5 - The Impact of Removing Tolls from Brisbane's Toll Roads

Zenith is the only travel modelling system to have consistently delivered accurate forecasts for toll roads in Australia.



A Glance Under the Hood

The Zenith model is an advanced implementation of the well-established four step modelling process. The model is fully multi-modal, and includes active travel modes, as well as multiple modes of access to the transit system (walking, park 'n' ride, kiss 'n' ride).

Reflects several forms of induced demand

Zenith is a variable demand model, meaning that changes in the transport network can result in changes in travel patterns, including *induced demand*, related to changes of destination, mode and route.

Zenith is also sensitive to changes in pricing policy, demographic profiles, and the spatial distribution of land uses.

Travel Market Segmentation

The model includes numerous trip purposes, including:

Segmentation by:

- Travel market
- Trip purpose
- Car ownership

- Home based work (white collar)
- Home based work (blue collar)
- Home based education (primary)
- Home based education (secondary)
- Home based education (tertiary)
- Home based shopping & personal business
- Home based recreation & social
- Home based other (serve passenger)
- Business travel (work based work)
- Work based shopping
- Work based other
- Shopping based shopping
- Shopping based other
- Other Non-Home Based
- Airport – resident and visitor business travel
- Airport – resident leisure
- Airport – visitor leisure
- Visitor – recreation
- Visitor – shopping



- Visitor – other

Home based purposes are also segmented by household car ownership level (0,1,2,3+), which significantly boosts the accuracy of the mode and destination choice models.

Modes

All Zenith models are multi-modal, including:

- Car drivers
- Car passengers
- Pedestrians
- Cyclists
- Public Transport
 - Walk access
 - Car access
- Freight
 - Light
 - Heavy
 - Port

Fully multi-modal,
including freight

Freight

Zenith includes three freight segments: light trucks, heavy trucks, and trucks related to the Port. The treatment of freight within Zenith has recently undergone a major upgrade which has significantly boosted the accuracy of Zenith's freight predictions.

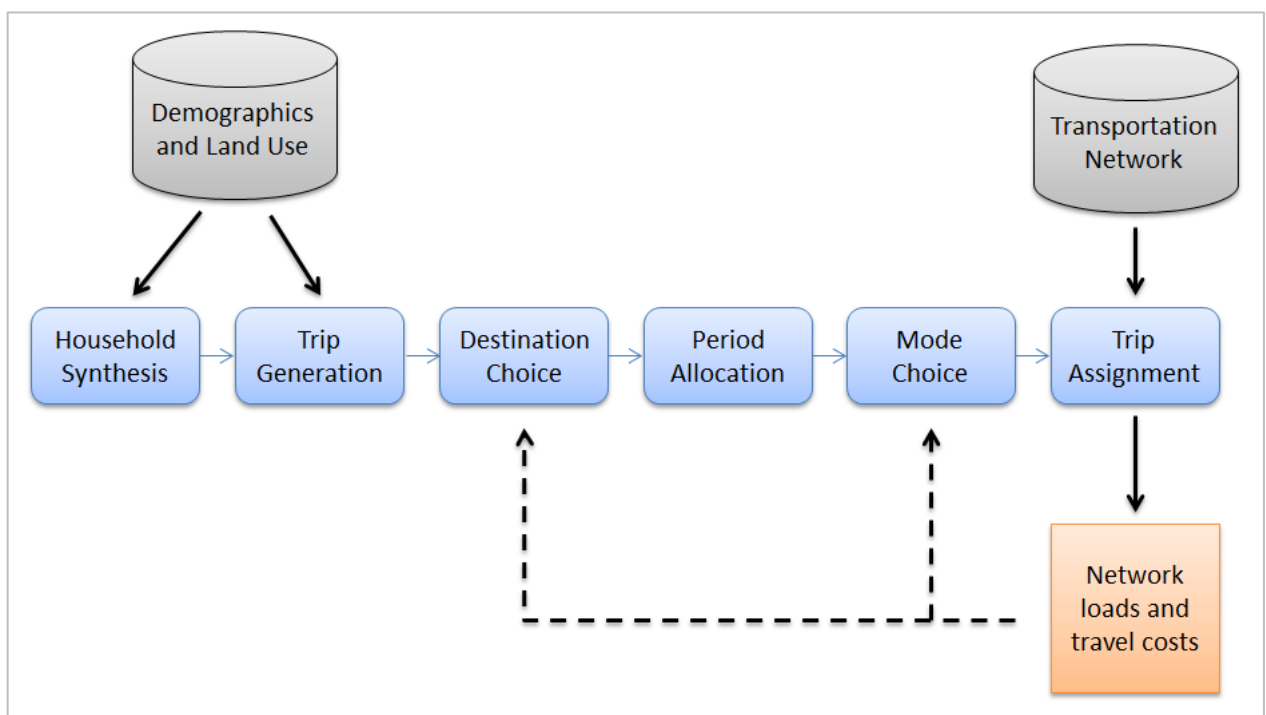
Modelling Process

The model structure, illustrated on the following page, includes the following components:

- **The Household Synthesis Model**, which stratifies households according to their household size, number of workers, dependants, and cars, etc.
- **The Trip Generation Model**, which calculates trip productions and attractions by trip purpose, based on household types, employment (by 13 categories), and the location of special generators (airports, ports, theme parks, etc.)



- **The Destination Choice Model**, which calculates destination choices based on zonal trip attractions and zone-to-zone travel costs by mode and time of day.
- **The Period Allocation Model**, which allocates trips to the various time periods (using fixed proportions defined spatially and by trip purpose).
- **The Mode Choice Model**, which calculates modal choices based on zone-to-zone travel costs by mode and time of day. The mode choice follows period allocation, which means that modal choices vary by period.
- **The Trip Assignment Model**, which calculates route choices, based on link speeds, capacities, congestion levels, tolls, transit frequencies, stopping patterns and fares. The trip assignment model outputs demands by cars, trucks, pedestrians, cyclists, and transit passengers on individual roads and transit services.





Commercial and
academic licences
available

Availability

The Zenith Models are available for use under commercial and academic licences, complete with comprehensive documentation, training courses, and user support.

VLC also offers consulting services to support your use of Zenith, or to deliver modelling services to your project.

I want to know more about Zenith!

If this overview has whetted your appetite, check out our website: zenith.veitchlister.com.au. There you'll find numerous technical documents which go into much greater detail about the inner workings and capabilities of Zenith.

In particular, look for *TN01 – Model Design & Architecture*, which provides a technical overview of the Zenith model.

Also check out the documentation related to your specific region of interest.

And if you're interested in seeing Zenith in action, check out our online video tutorials!

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