Data standards for the New Zealand transport network

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Scope

Road network model that can be used to resolve queries and ask questions about the network.

Auckland Central Motorway Junction
Multiple representations of road network – how to index across them.
The Question

Is there a way to normalise spatial content of data without duplication or reformatting data?

Can we take a dynamic traffic centric view of how vehicles traverse the network rather than a road asset centric view?
How to be resilient to change in a continuously changing environment.
Context of problem

GIS/BI systems typically have long update life cycles – not good for real time applications.

Real time systems very transient, constant change.

Causes data quality issues as data flows from real time front end systems to back end analytical systems due to out of sync network data.
Research question
Is it possible to build a network model that:

Supports querying data across diverse data sources;

Multiple representations of Road network – how to index across them
Research question

Is it possible to build a network model that:

Can be abstracted to a level insensitive to transient changes;
Research question

Is it possible to build a network model that:

Supports cost base routing to support linear association of data across network.
Turns out basic primitives required are:

- Direction (journey in one direction not always the same as return journey);
- Basic topology (snap movements to links);
- Connectivity (decision points of movements at nodes);
- Move all the transient data about the network out of the model and into the attributes.

A link and node model
Learnings

- Start to use traffic data movements to update model faster instead of waiting for update cycles to permeate down from GIS etc.
- While trying to remain system agnostic, we will still need some form of GIS to abstract model from;
- Level of abstraction of nodes needs work - some junctions are complex.
Questions

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As transport network operations become more and more time critical the requirement for knowledge of the performance and state of the network becomes more significant for decision support. Sensor technology is advancing quickly, particularly with respect to the 'Internet of Things', and there are significant amounts of data and information generated by a number of internal and external sources that relate to transport network and require processing. An inherent embedded component of the data sources is information about the transport networks themselves. Typically, this spatial attribute is developed to meet the specific needs of an application leading to diverse representations of the same transport network.

There is a lack of transport specific data analysis platforms that are resilient to change, are lightweight and cost efficient to maintain. Analytical tools are often tied to specific proprietary systems that compromise adaptability and create latency in terms of keeping up with the rapidly changing developments, and indeed in representing transient changes in transport networks.

This report proposes a method that will support normalising diverse network representations of selected data sources, and support presentation of the information within the context of a standardised reference transport network model.

Keywords: data model, network model, real-time operation, resilience