FIG WORKING WEEK 2025
AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE
Collaboration, Innovation and Resilience: Championing a Digital Generation
FIG Geospatial Council of Australia
Brisbane, Australia 6–10 April

Linear referencing a New paradigm

Robert Potter
Spatial Alignment Lead
Victorian Department of Transport and Planning

ORGANISED BY FIG Geospatial Council of Australia
PLATINUM SPONSORS Australian Government CHCNAV esri THE SCIENCE OF WHERE Leica Geosystems HxGN MetaPer Surveyors Australia

Linear Referencing – The Old

The concept of referencing things by the measure along a path has been around for centuries

- From very old Japanese examples
  - 300+ years old
  - 100m long scroll
- To the mid-20th century used by Vicroads
  - Major state highway scrolls used for the location of assets

Linear Referencing – The Old, Current

The Stars on this road represent locations along the network

- The route is calibrated by the field driven length.

The problem is that the spatial representation of the route does align with what is on the ground.

An Absolute Location Reference versus A Relative Location Reference

Absolute Reference (aka GPS, Coordinates)

- Is independent of any graphical representation

Linear referencing (aka Chainage, SRRS)

- Location is relational to the location definition of another GIS geometry

Dynamic Segmentation
Location by route measure

ROUTE	ID	START MEASURE	START MEASURE	FEATURES DESCRIPTION	GEOMETRY
2000F	A	50		Vehicle Breakdown	Point
2000F	B	150	200	60 Kph Zone	Line
2000F	C	70	240	Wire Rope Barrier	Line

The New DTP Approach

- We have adopted Open Street Map as our operational network geometry for use in a variety of transport applications
  - Implemented a platform that conflates our authoritative road network for gazetted road names
- Stopped the requirement for roads to be driven and the routes to be calibrated
  - The resolution of aerial photography is such that the ability to pick and geographically locate intersections is as good, if not better than can be done by driving the network
- The systems that require a route measure (chainage) it is calculated dynamically and date stamped
  - Route features are stored as coordinates and measures derived.

How does that help?

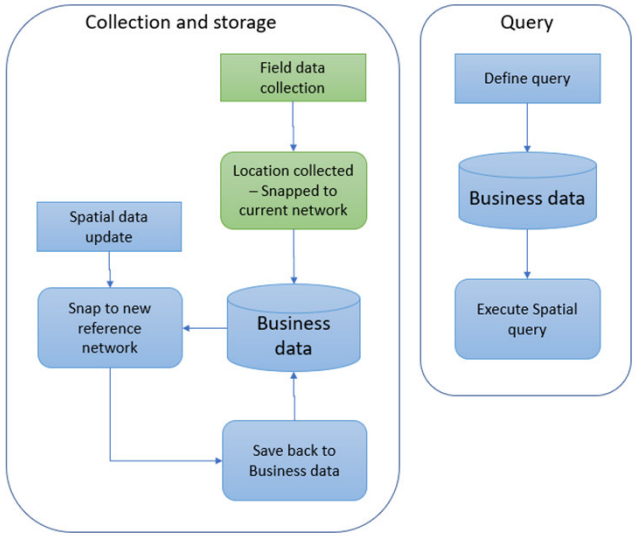
- High frequency of network update can be accommodated
- Field attributes collected on one network can be queried on another
  - By time – older version of the network
  - Network collected against – collected by declared road reported by bus route

Cheaper – less people required

Reality – Better represents field

Reporting – Allows for historic reporting

Current Process

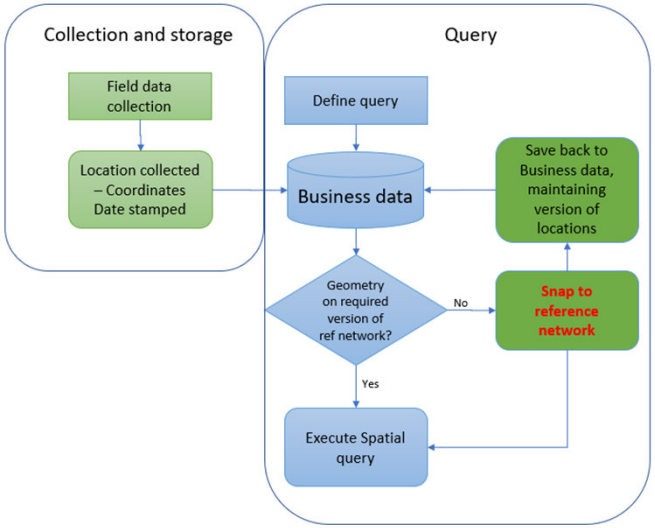


Assumptions:
- Data is always held on current version of network
- Queries are always against current network

Advantages:
- Not pre-processing for queries

Disadvantages:
- All data has to be processed with every reference data update
- Queries against "as was" or "to be", networks difficult

To Be Process



Assumptions:
- Data is always held as coordinates and time stamped
- Versions of geometry are maintained

Advantages:
- Queries can be made against any epoch of reference network
- Data not held against a road thus more flexible

Disadvantages:
- More processing
- More storage required

The Paradigm Shift

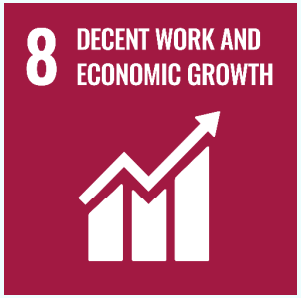
Current	New
Routes created by dissolving on attribute value	**Routes generated by geometric path through the network**
Routes calibrated by driven route length distance	**Routes calibrated by mapped length**
Roads layer has all attributes	Roads layer has minimal attributes
Geometry managed along with attributes	Geometry managed independently of the attributes
Manage Attribute in master file	Generate extracts to deliver business value

The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG

2nd relevant SDG

3rd relevant SDG



SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals

STEP 1: SELECT HERE THE THREE MOST RELEVANT SDGs
STEP 2: COPY THE SDG INTO PREVIOUS SLIDE