A Review of the Clarity Generalisation Platform and the Customisations Developed at Ordnance Survey Research

Patrick Revell

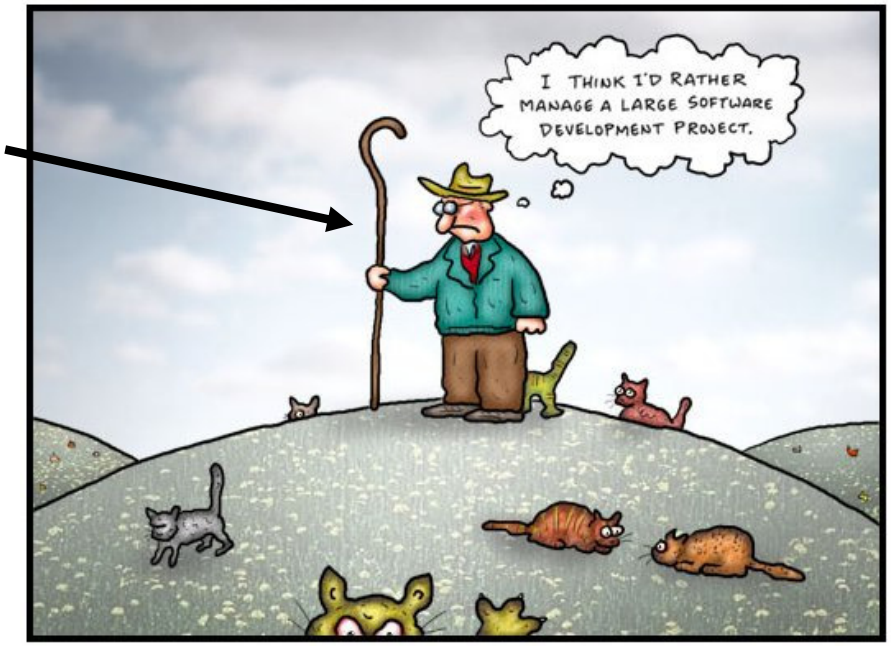
Research Scientist

20th June 2008

Introduction

- Clarity:
  - Software platform dedicated to generalisation, created 2003
  - Consolidates experience from AGENT project
  - Funded by 1Spatial, IGN-F, IGN-B, KMS and OSGB
  - MAGNET partners coordinate developments with 1Spatial

- OS Generalisation Team:
  - Nicolas Regnauld (Team Leader)
  - Patrick Revell
  - Stuart Thom
  - Sheng Zhou



Clarity Architecture

Clarity:

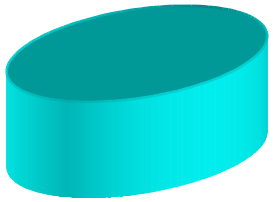
- Display/Query
- Process
  - Sequences
  - Agent
- Customise
  - Menus/Toolbars
  - Algorithms

Agent:

- Agents perceive surroundings
- Determine conformance to constraints
- Propose algorithms to increase satisfaction
- Maximise satisfaction of set of constraints

Java API

Lull API



Gothic OO DB

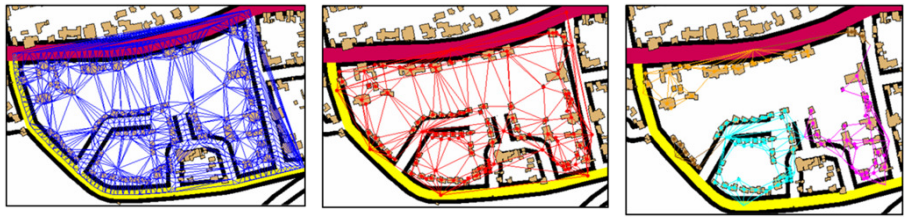
Legacy Applications:

- Database management
- Define data model/topo rules
- Data import/export
- Create maps
- No Oracle connection

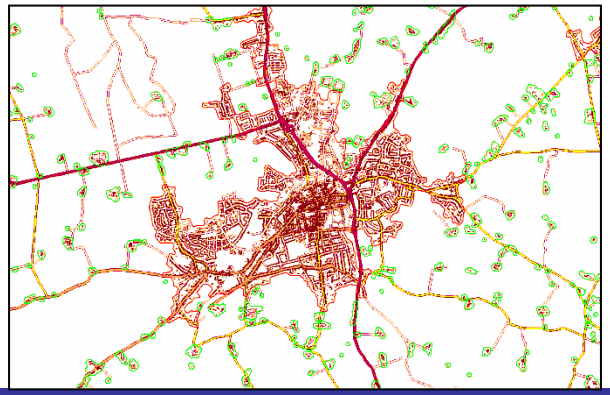
Spatial Structures - Proximity

- Topology (“touches”, “connects to”)
  - Required by Clarity algorithms
  - Topological querying Java API
  - Topological modification Java API

- Delaunay Triangulation (“close to”)
  - New Java API
  - Proximity graph and MST
  - Centreline Skeleton

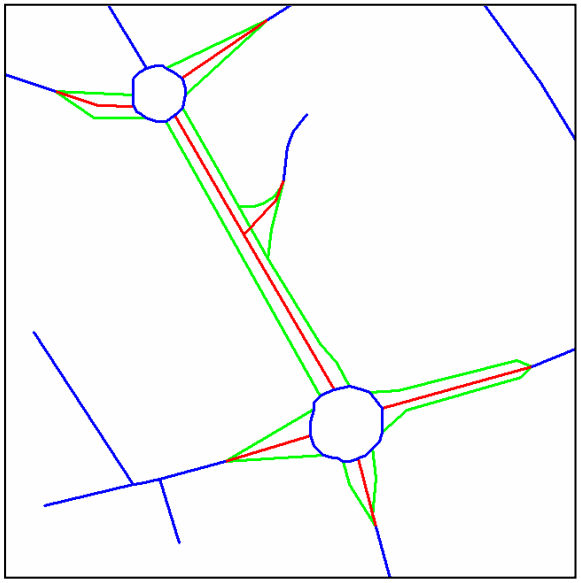


- Clustering (“close to”)
  - For large numbers of objects
  - Java implementation
  - Use for Urban/Rural Identification

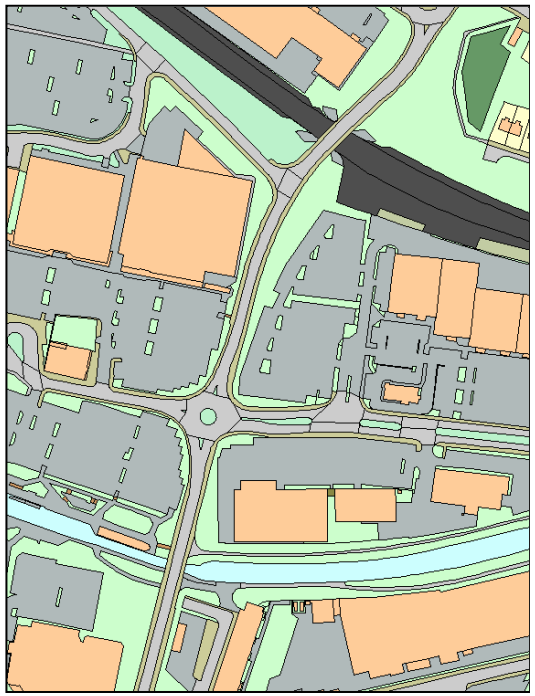


Spatial Structures - Networks

- Road network:
  - Too detailed
  - Detect and collapse:
    - dual carriageways/traffic islands
    - roundabouts, interchanges etc.

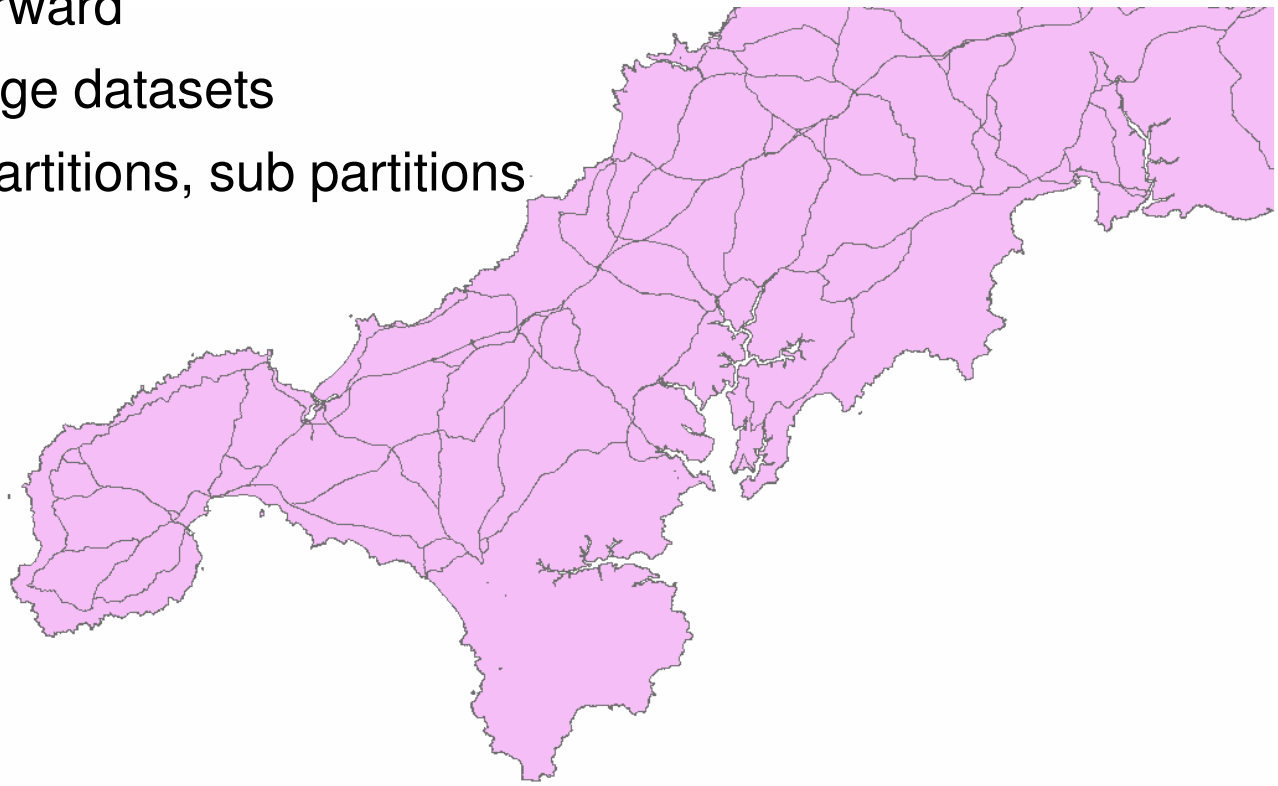


- Other networks:
  - Collapse hydro/track/path polygons
  - Deduce missing links in networks
  - Hydro network classified by width
  - Path/track network connected to road network
  - Still need to work on rail network



Spatial Structures - Partitioning

- Break down dataset into autonomous regions
- Clarity: Create partitions from topologically structured network data
- Set up not straightforward
- Cannot cope with large datasets
- Workaround: main partitions, sub partitions



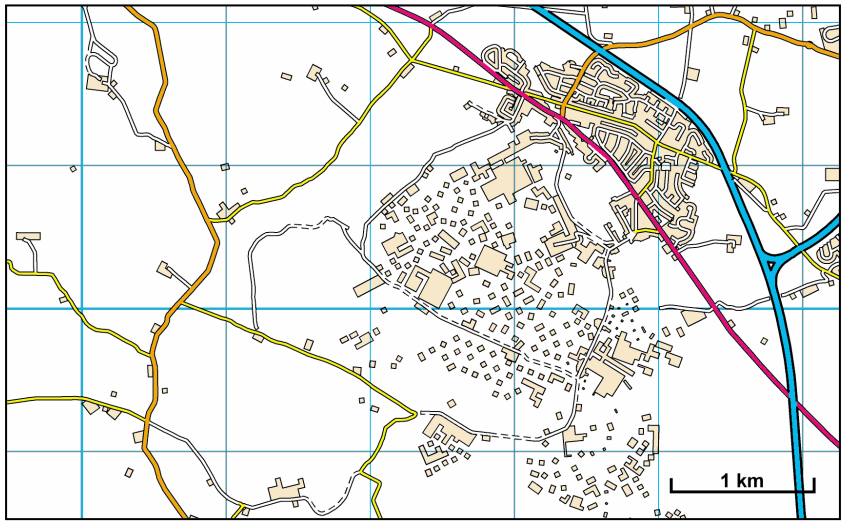
- See also: Chaudhry & Mackaness: “Partitioning Techniques to Make Manageable the Generalisation of National Spatial Datasets”

Building Generalisation

- Clarity Algorithms
  - 2 Simplification
  - Local enlargement
  - Building amalgamation

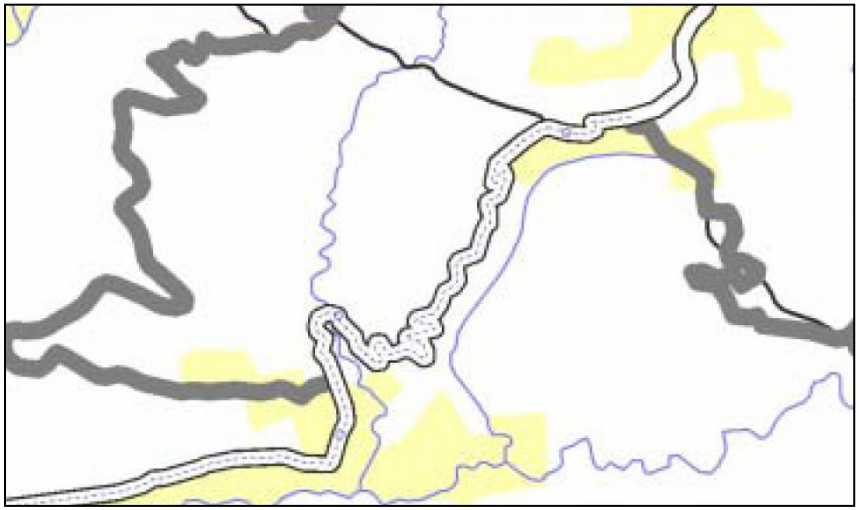
- 1:10 000 scale project
  - Simplification
  - Displacement (IGN)

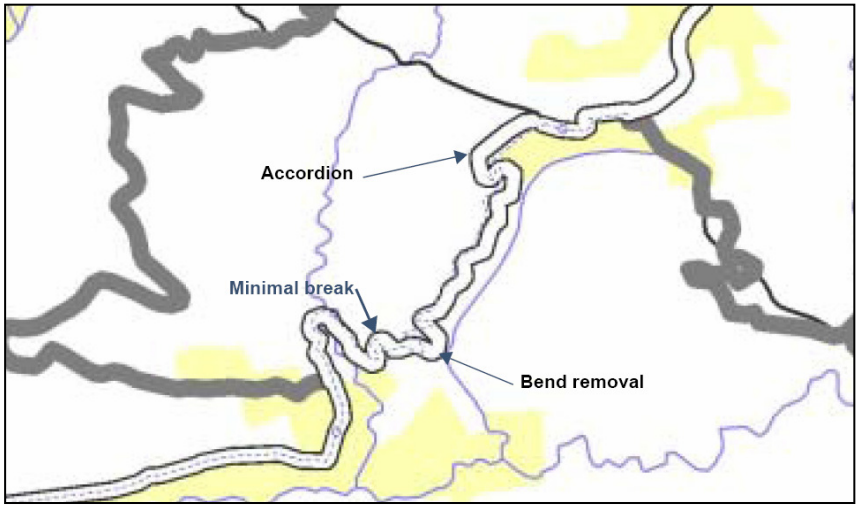
- 1:50 000 scale project
  - Rural: Squared amalgamation
  - Urban: Growing tide
  - Agent process for both



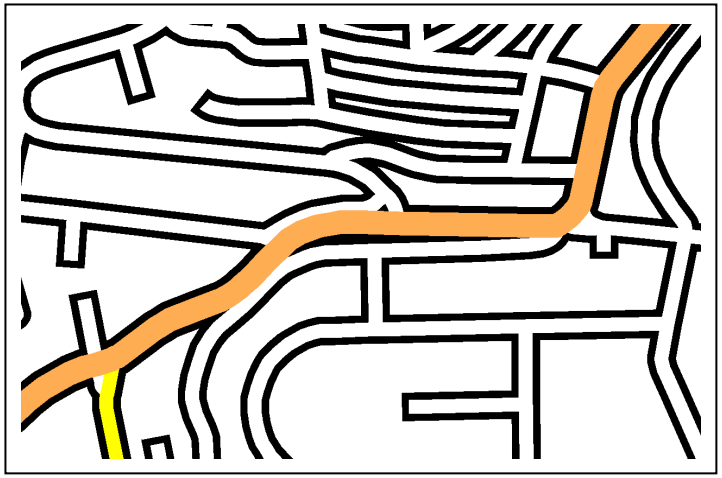
Road Generalisation

- Sinuous Mountain Roads





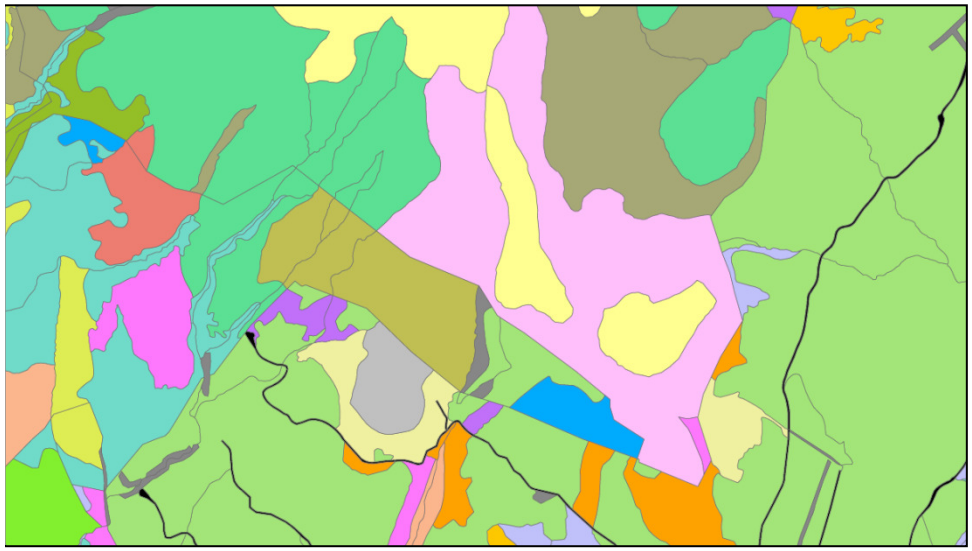
- Displacement
  - Beams (hard to set up in Clarity, doesn't work on large networks)
  - Push (University of Hannover, Clarity integration)
  - Agent system evaluates both and selects best result

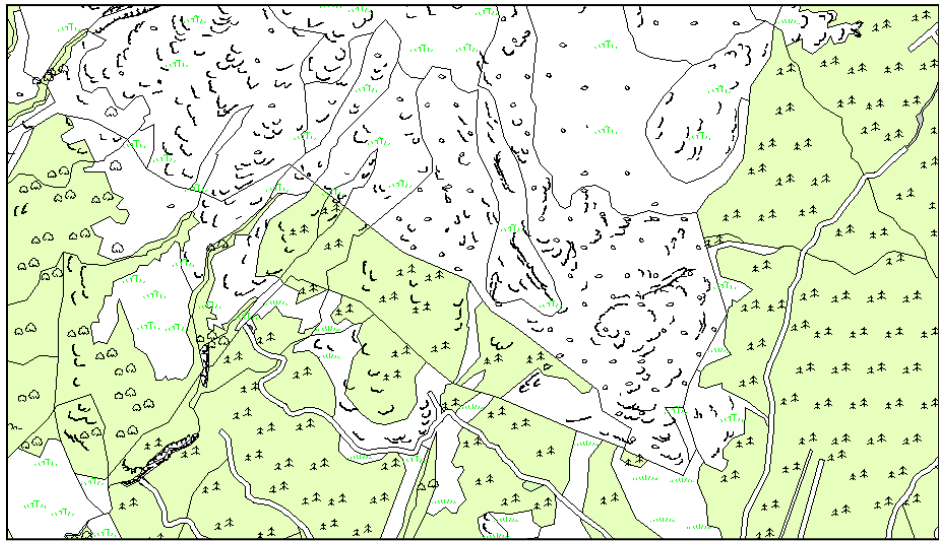


Landcover Generalisation

- MSc project – large scale woodland 1:250 000 scale

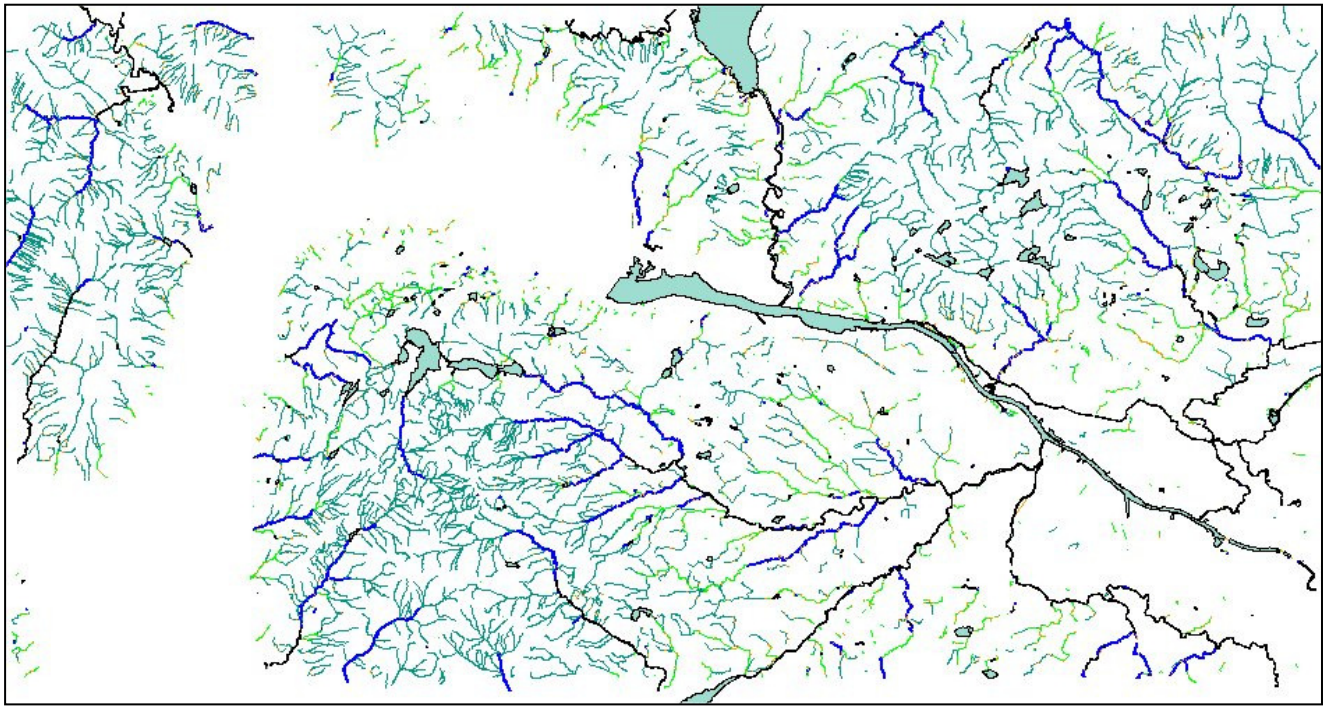
- Landcover reclassification (combinations)
- Topological Gen:
  - Dissolve: by attribute/small holes/small areas
  - Simplify shared boundaries
- Symbol placement





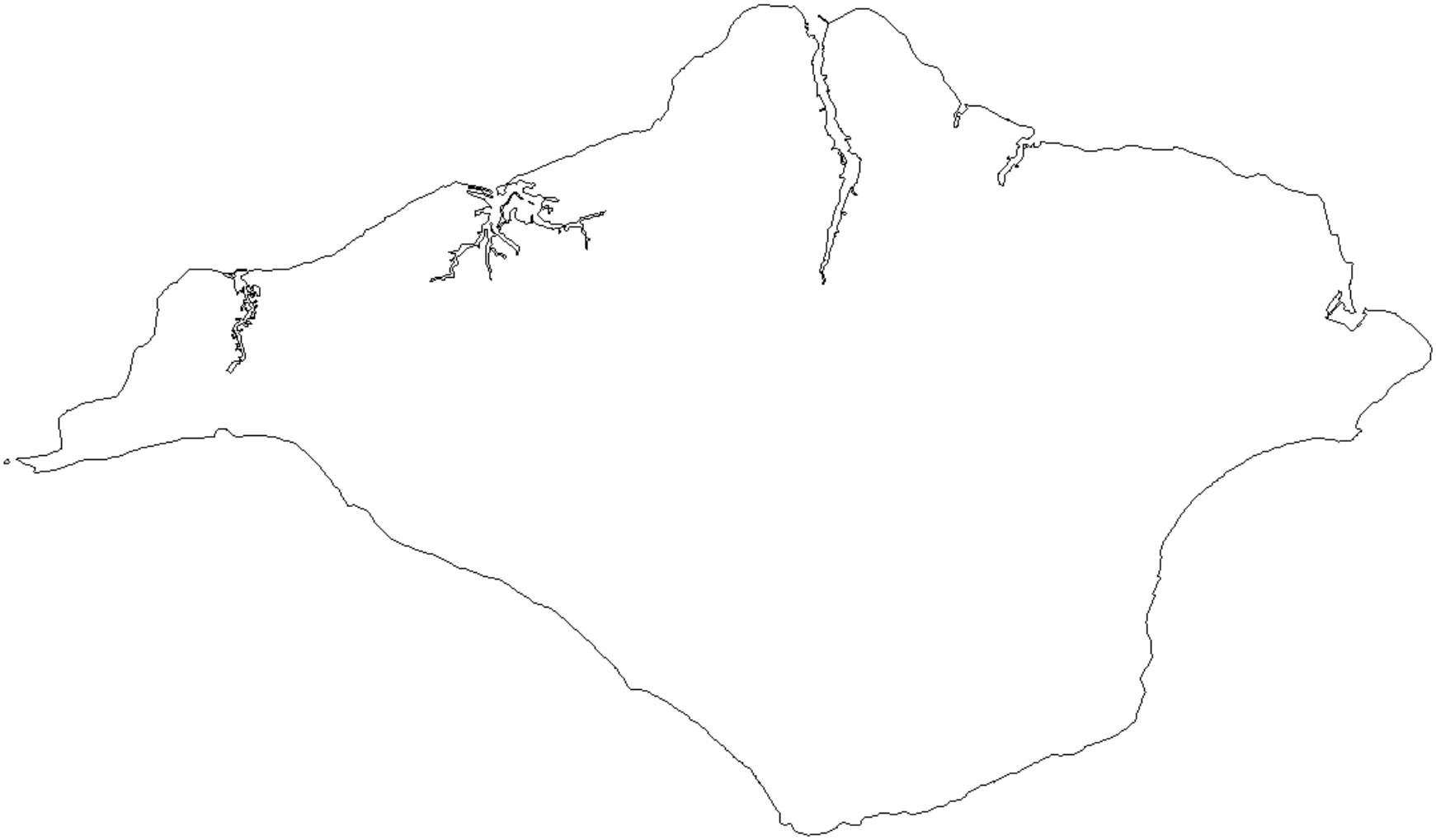
Hydrology Generalisation

- Start with deduced hydrology network
- Analyse network, derive hierarchy
- Prune network – remove small streams
- Some rivers remain as polygons (buffer narrow sections)
- Rest are symbolised centrelines, based on original polygon width

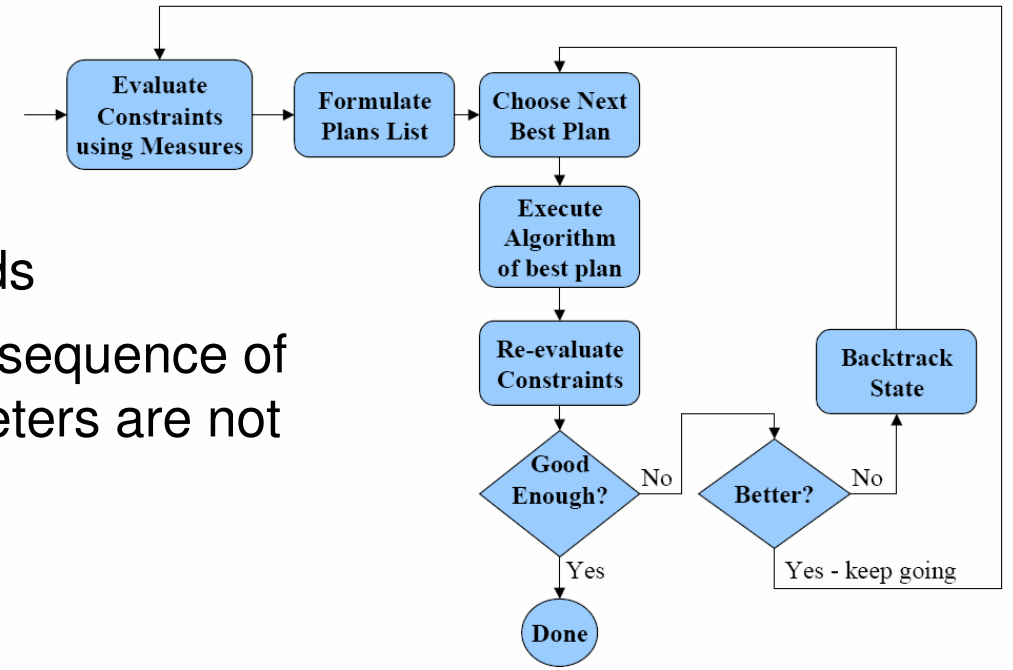


Coastline Generalisation

- Weighted Effective Area algorithm (extends Visvalingham Whyatt)



Agent System

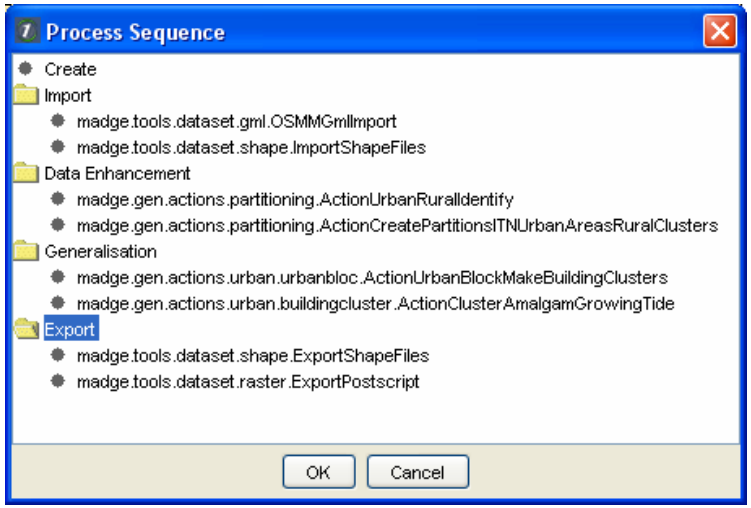


- Good for buildings and roads
- Useful for Carto Gen when sequence of algorithms and best parameters are not known in advance

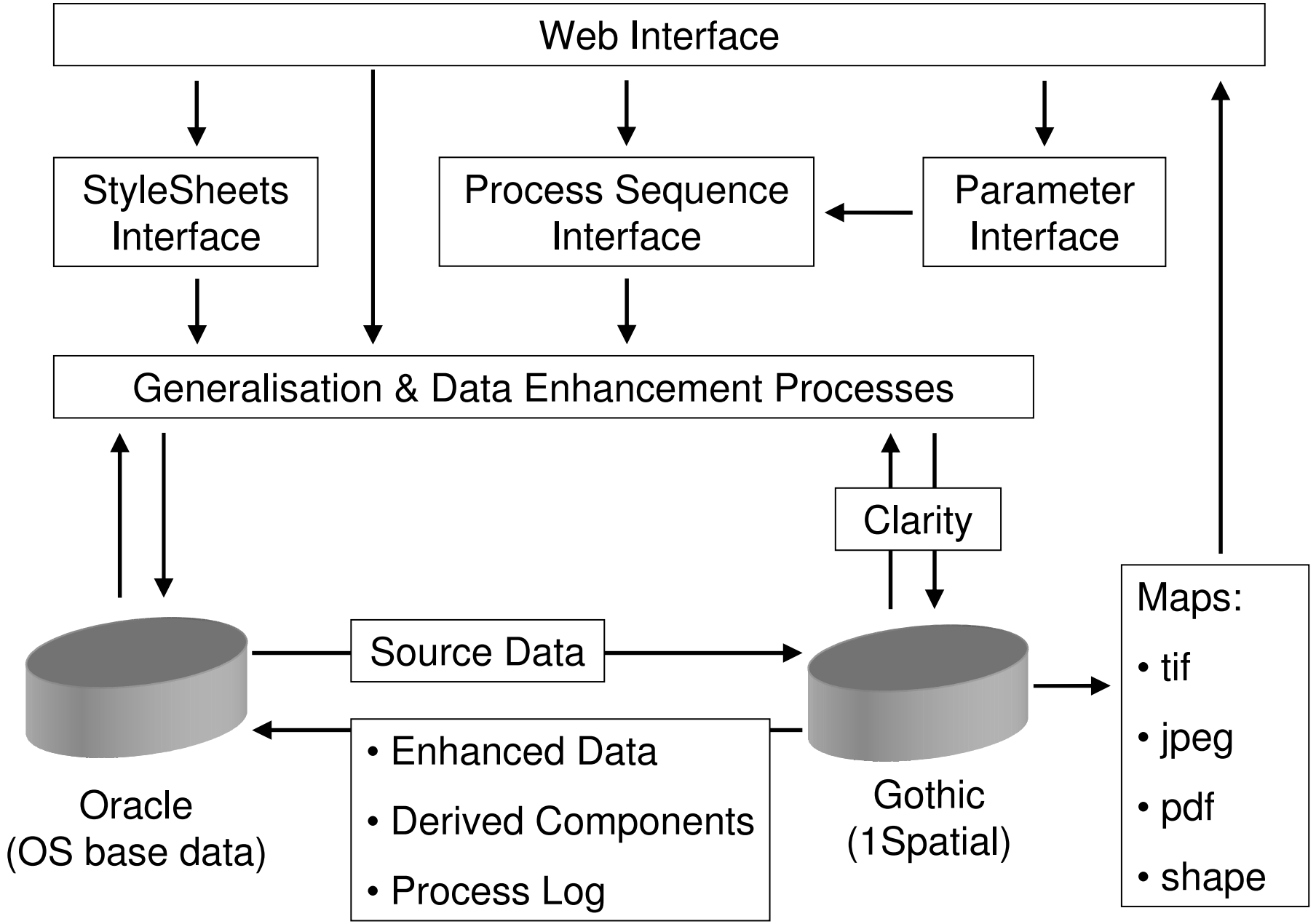
- Performance overhead
- Time consuming to configure and debug
- Only use it when there are obvious benefits
- Sequential Model Gen/data enhancement, better outside Agent

Process Sequences

- Clarity XML process sequences
- Run in single edit session; if something goes wrong all it lost
- Long sequences, large datasets, Clarity can run out of memory
- New approach master Clarity invoke slave Clarity instances



- Recording of process history (Zhou, Regnauld and Roensdorf, “Towards a Data Model for Update Propagation in MR-DLM”)


Web Interface
StyleSheets Interface
Process Sequence Interface
Parameter Interface
Generalisation & Data Enhancement Processes
Clarity
Source Data
• Enhanced Data
• Derived Components
• Process Log
Oracle (OS base data)
Gothic (1Spatial)
Maps:
• tif
• jpeg
• pdf
• shape

Conclusions

- Clarity fragmented legacy products, database not Oracle
- Strong Clarity functionality is hard to access/configure
  (Agent, Beams, Topology, Lull algorithms)
- OS made tools make Clarity easier to use

- OS data need enhancing before Gen, tools not in Clarity
- Clarity algorithms mostly not applicable to OS data
  (EuroSDR: all Gen platforms require NMA customisation)
- But Clarity good base for developing new algorithms

- Now have strong toolset for generic platform
- MAGNET collaboration beneficial
- Web services expands scope for future collaboration

Merci pour votre attention !