Automatic generation of bus route schematic signs

Mor Yaffe
mory@stl.co.il
Systematics Technologies
About us – Systematics Technologies

- Systematics Technologies – esri’s distributor for Israel
- Representing esri for over 30 years
- Located in Tel Aviv
Israel Ministry of Transport and Road Safety

• Holds general responsibility for planning and development of the transport network
• One of its prime goals: Utilizing advanced technologies in the operation of transport facilities
• The national Public Transit Authority (part of IMOT) is responsible for all aspects of public transit regulations & planning
Static bus stations signs project

- In 2011 The IMOT’s Public Transit Authority started an ambitious initiative for bus stations signs standardization.
- The idea was to force a nation-wide standard that all bus companies will have to use for creating new informative and good-looking signs for each bus stop throughout the country (~30,000).
The standards book

- The IMOT hired graphic design studio, which published a standardization book, accurately defining each component of the bus stop sign
- Every component (reference map, bus route diagram, schedule etc.) was given a specific location, size & look
The Challenge

- A central part of the sign was supposed to be a “linear” (orthogonal schematic) map of all the bus routes stopping at the station.
- Originally planned to draw these manually, for each and every bus stop.
- When realized they need to produce 30,000 of these in just 6 months, and then re-produce it periodically upon updates, they came to us …
The process

- Identified as a perfect use case for ArcGIS Schematic’s geo-schematic algorithms
- Imported all the GIS data into enterprise gdb
- Snapped every stations point to it’s corresponding route line
- Every route, along with it’s stations, moved slightly for creating separate routes
- Built geometric network from bus stop points and bus route lines
Applying Schematics Algorithms

• First stage: Creating the “angle directed” representation of the network
• After a long debate…. The 90° approach was selected over the 45° one
• The Schematics “Geo - Angle Directed” was successfully used for that
...Schematics Algorithms – cont.

- Next, for creating the “visual separation” between several bus lines & stops following the same physical route, we tried to use the “Geo-Partial Overlapping Links” algorithm.
- Unfortunately, couldn’t get it to produce decent results.
The solution: Shifting by editing

- After applying the angle directed algorithm, exported the resulting schematic layers to feature classes
- Through edit session, selecting each line present in the map, along with the stations, and moving by increasing interval
The final challenge: Streets schematics

- The standardization book defined the streets should be orthogonal, along with the orthogonal bus routes.
- Attempt to build network from street centerlines and applying the same “Geo - Angle Directed” algorithm, resulted in streets not aligned with bus routes.
- The solution: creating a unified geometric network from bus routes, bus stops and street centerlines, and applying the “Geo - Angle directed” algorithm to the entire unified network.
Final product

- Used another schematic algorithm – “Hierarchical Smart Tree” to create the route line diagrams of the sign (that was easy …)
- Rest of the sign components were arranged into ArcMap layout elements
- ArcObjects app programmed to accept a bus stop ID as parameter, and produce the entire sign automatically (altering content of map frames & layout elements)
- The entire process takes about 12-15 minutes of processing for final product (completed pdf file ready for print) for every single bus stop
Lessons learned & Conclusion

• The IMOT approached us only for the linear map component, but eventually, ArcMap’s API enabled the automation of the entire sign

• The only schematic algorithm which was actually used for the linear map is “Angle Directed”, but it saved 100s of hours of manual drawing

• The final product handed to IMOT, enables them mass, periodic production of signs, which are already in place everywhere
Thank You !!

mory@stl.co.il
Will be around for questions ....