

Advanced TRANSIMS Visualizations - TransVis Capabilities and Usage

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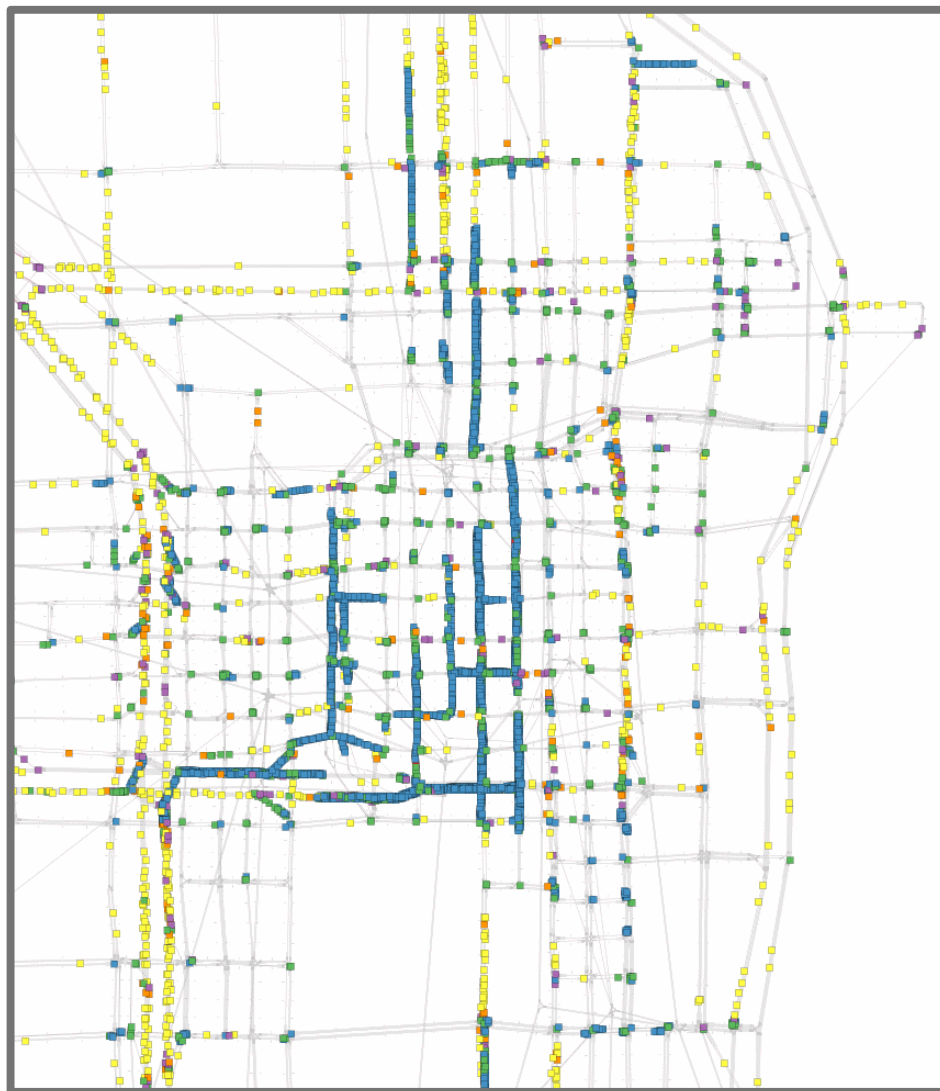
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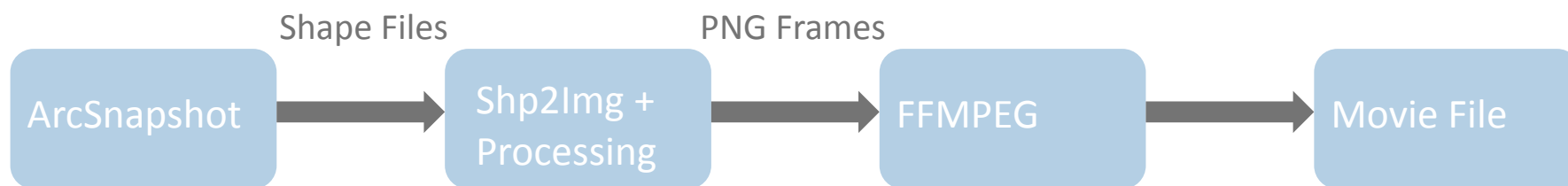
Early Transims Visualizations: ArcUtilities

- The best way to get visual feedback from TRANSIMS version 4 initially was to use the ArcUtilities (ArcSnapshot, ArcNet, etc...) to display static plots in ArcGIS
- This method is very stable and its merits are proven, however the lack of interactivity greatly slows down analysis. There are limitations in terms of available visual paradigms to convey complex information.

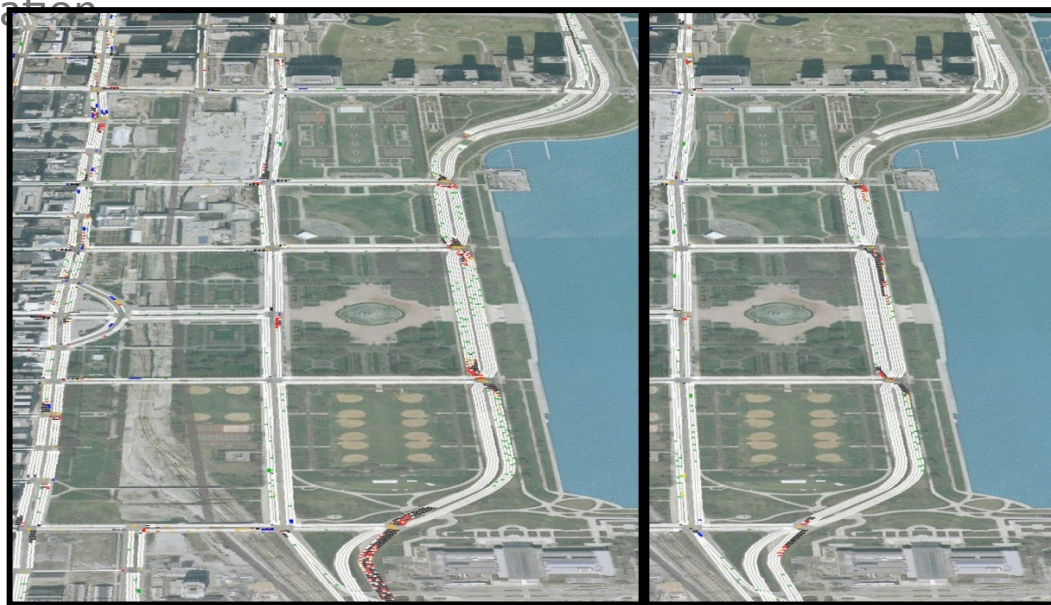


Early Transims Visualizations: Shp2Img Pipeline

- The technique developed at TRACC advanced to create a pipeline between various utilities to create a movie file of the snapshot data



- This technique was later expanded to provide: car coloring by attributes, pseudo-3D effects, and interpolation



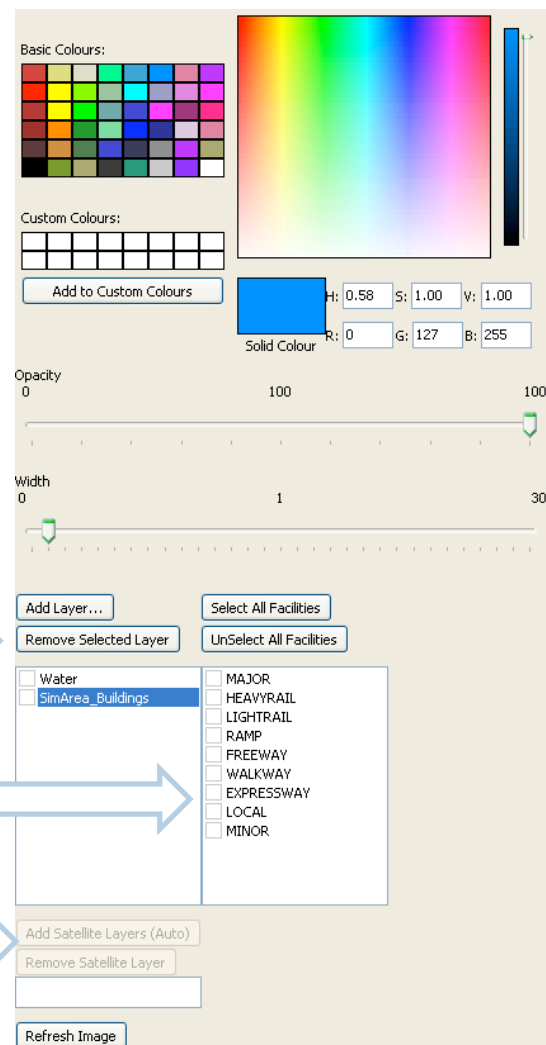
TransVis Software Goals

- TransVis is designed to bridge the current shortcomings TRANSIMS has to easily display and decipher results once the program has run. The development was undertaken with several metrics in mind:
- **Backwards Compatibility:** The software would have the capability to display any of the current shape files being produced by TRANSIMS ArcUtilities
- **Interactivity:** Allow users to interact with snapshot (and other types of) data spatially and temporally
- **Movie Production:** Allow users to capture frames and render movie files for the purposes of presentation material
- **Creative Visualizations:** Provide creative paradigms for visualizing complex data concepts such as congestion
- **Cross Platform:** As TRANSIMS is cross platform, the visualization software should be as well. It will be integrated with the concurrently developed TRANSIMS Studio software package.



Backwards compatibility: ESRI ShapeFile Designer

- The software's interaction with shape files is handled through the open source program shp2img and the corresponding underlying .map files
- The Design Tab has several functions:
 - Changing Color and Opacity of Layers
 - Importing Shape Layers
 - Altering Color, Opacity, and Width of individual facility types
 - Importing Satellite Layers



Interactivity: Navigation

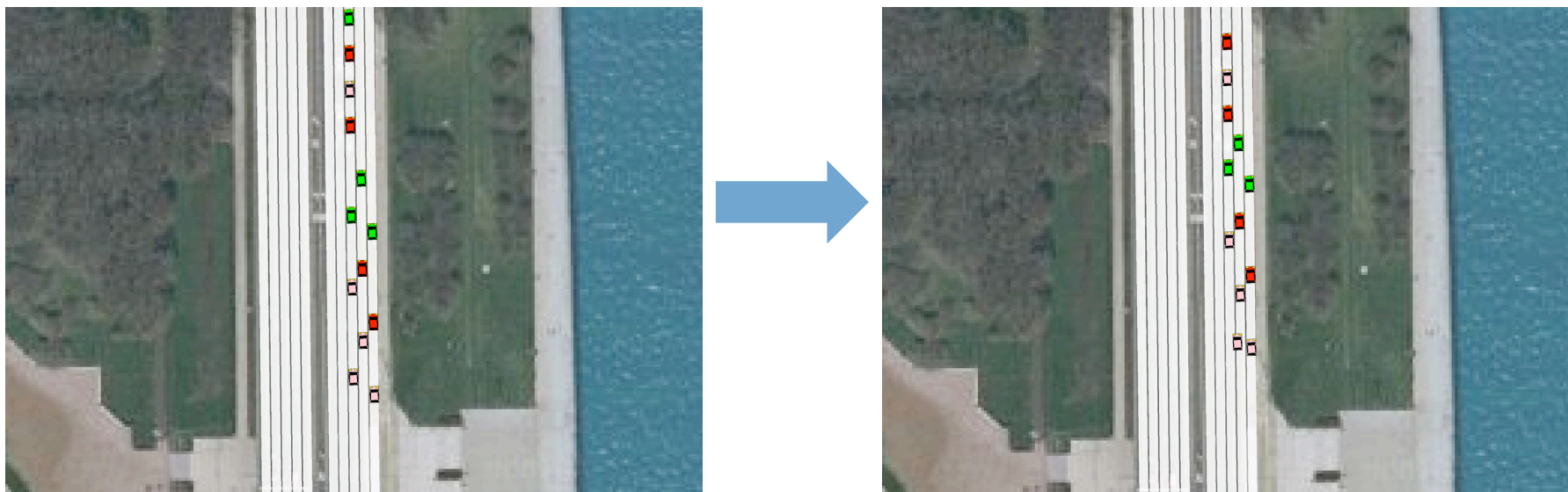
- TransVis supports conventional GIS navigations such as panning and zooming



- TransVis also offers a pseudo-3D feel with mouse interactive rotation and perspective transforms



Interactivity: Visualizing Time-Dependant Data

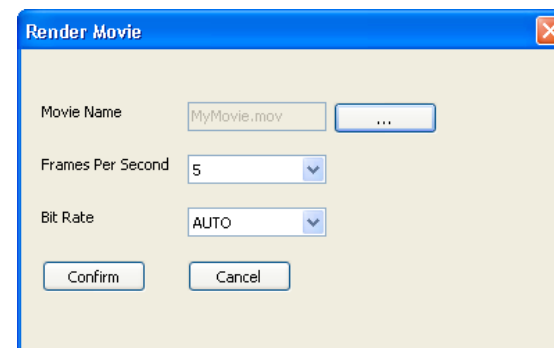
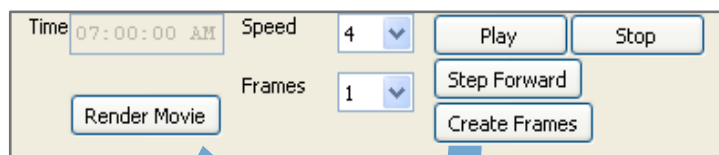
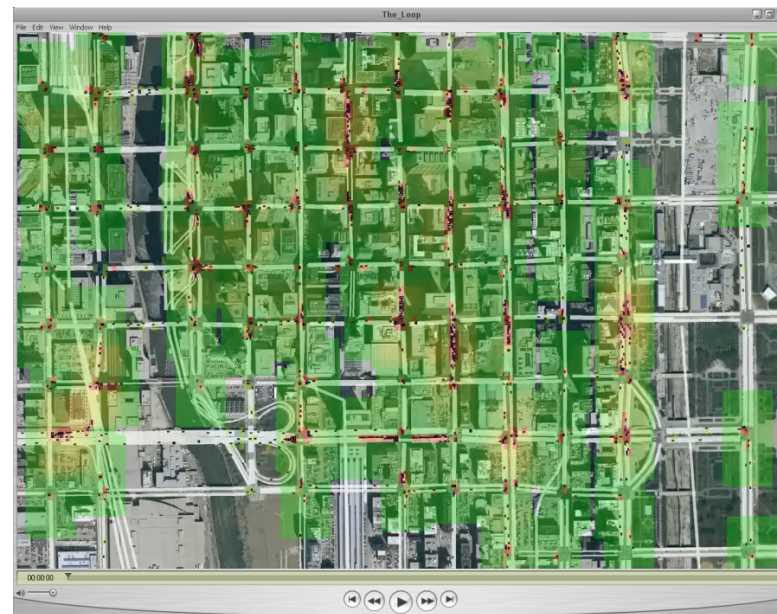


- There are several ways to navigate through time-dependant data with TransVis
 - The time slider bar allows quick navigation between key frames
 - The user can step forward one frame at a time
 - The user can play the data at various speeds and varying levels of interpolation

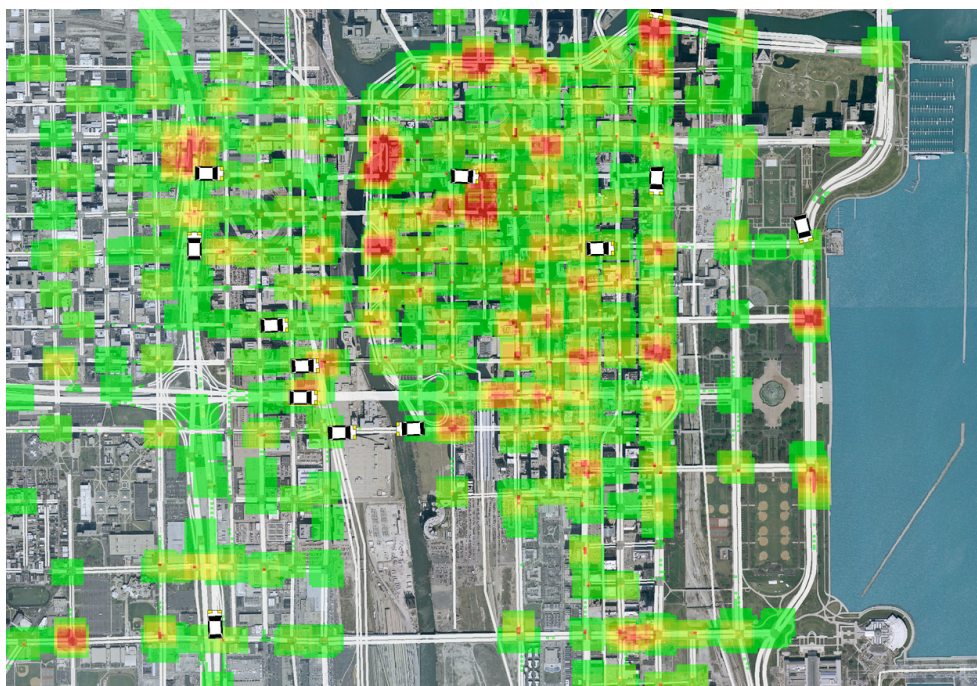


Movie Production

- Making a movie using TransVis is fairly straightforward
 - Configure the interactive mode so that it looks as desired for the start point for your movie
 - Click the “Create Frames” button to begin generating frames – minimize the window or watch as each frame gets rendered
 - When the movie encompasses the time interval desired, click the “Stop” button
 - Use the “Render Movie” button to alter the movie name, FPS, and bit rate
 - Confirmation runs ffmpeg in the background to generate the movie requested



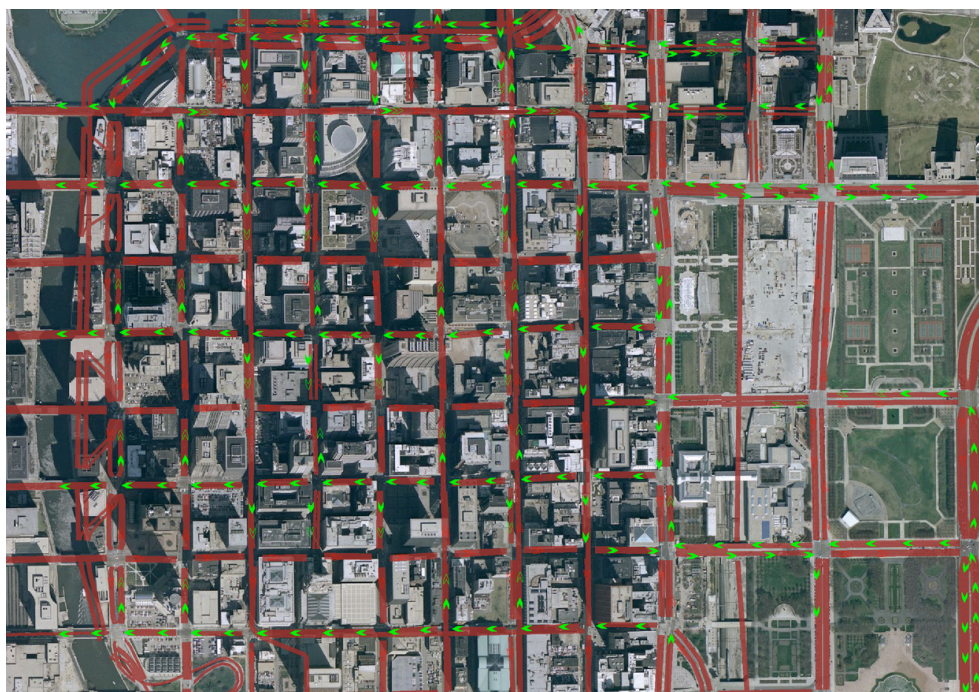
Creative Visualizations: Congestion Indicators



- The Heat Plot feature incorporates the following concepts:
 - Generates heat every step wherever a car is found.
 - Cars generate more heat the slower they moves.
 - Between time steps, the heat spreads to neighboring regions.
 - Over time a region will cool back down as it stops experiencing congestion.
- The Probe Vehicle feature incorporates the following concepts:
 - A random percentage of vehicles are selected to be “probe” vehicles
 - These cars are drawn larger so they are visible on the system level
 - This allows the user to easily understand what the average driver is feeling in various regions at one time

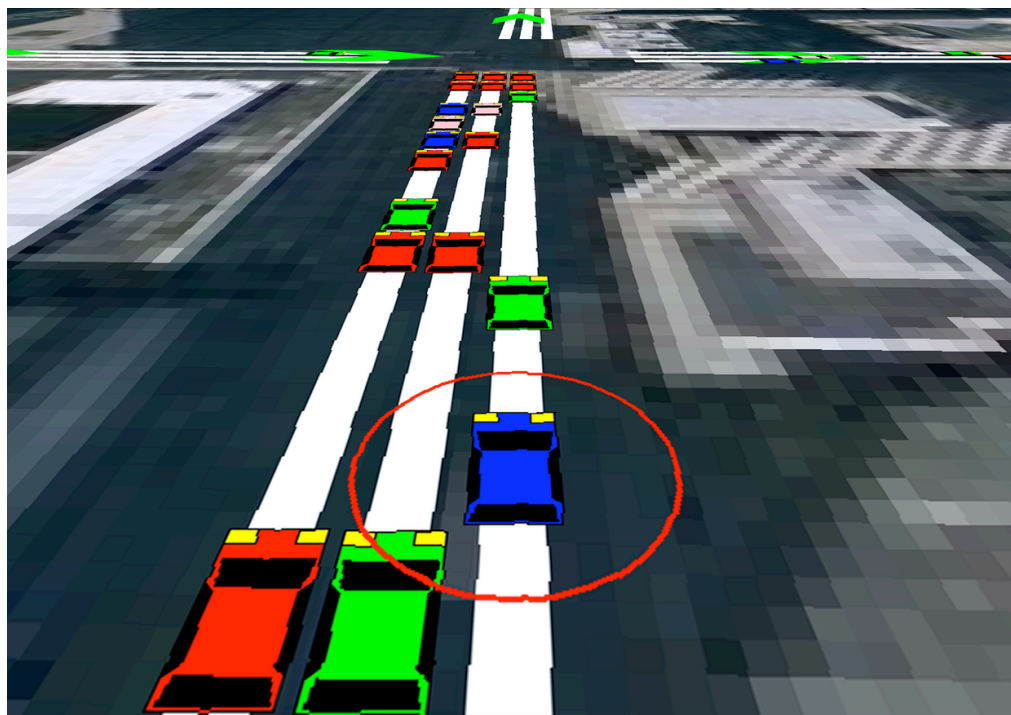
Creative Visualizations: Signal Synchronization Indicators

- Viewing signals at a system-level perspective is a very challenging task due to the ease of over-loading the visual system with all the possible information.
- The TransVis system-wide signal viewer incorporates the following ideas:
 - Utilization of a conveyor technique to naturally direct the eyes to detect healthy synchronization patterns
 - Option of using arrows to indicate directionality for static plots
 - Fading and slowing of arrows as red signals are encountered

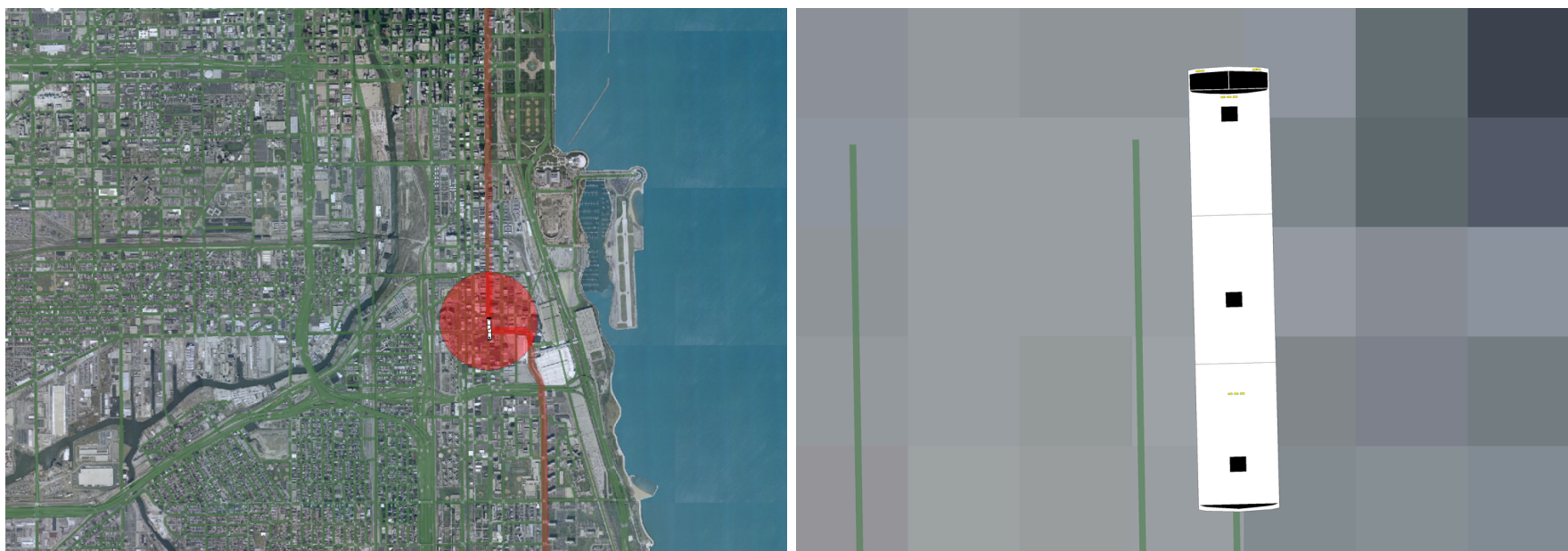


Creative Visualizations: Driver's Perspective

- TransVis offers the following technique to allow the user to see what the average driver experiences on their trip
 - Zoom in and rotate to nearly the driver's perspective
 - Attach the camera to a car
 - Follow the car second by second (or finer) through a portion of their trip



Creative Visualizations: Transit



- Currently TransVis supports two Transit-specific visualizations and has high detail 2D models for buses
 - Display of full route upon selection of the vehicle
 - A circle displaying the relative ridership to other transit vehicles being drawn

Future Developments

- Selected performance optimizations via integration with the Python C/C++ API
- Full compatibility on Linux and Mac
- Additional transit visualization paradigms
- Completion of a “fleet” of higher quality 2D vehicle models
- Complete project file logic: ability to save, build, and load configurations/viewpoints
- Side-by-side viewing: ability to open two copies side-by-side to compare cases interactively
- Side-by-side movies: automate the side-by-side movie rendering procedure
- Simple camera management: allow user ability to design camera sweep routines
- Stress testing and distribution – incorporating user feedback

