



Network conversion for SUMO integration

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Robbin Blokpoel
Senior researcher at Imtech Traffic & Infra,
robbin.blokpoel@imtech.com, +31 629409806



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Introduction

Part of project COLOMBO

- Low penetration cooperative communication
- Traffic surveillance algorithms
- Robust traffic control with low information
- Research requires full control:
 - ✓ TraCI interface, access to almost everything
 - ✓ Open source allows for quick extensions

Why converting?

- Quick network generation
- Updates in one format directly to applied to other

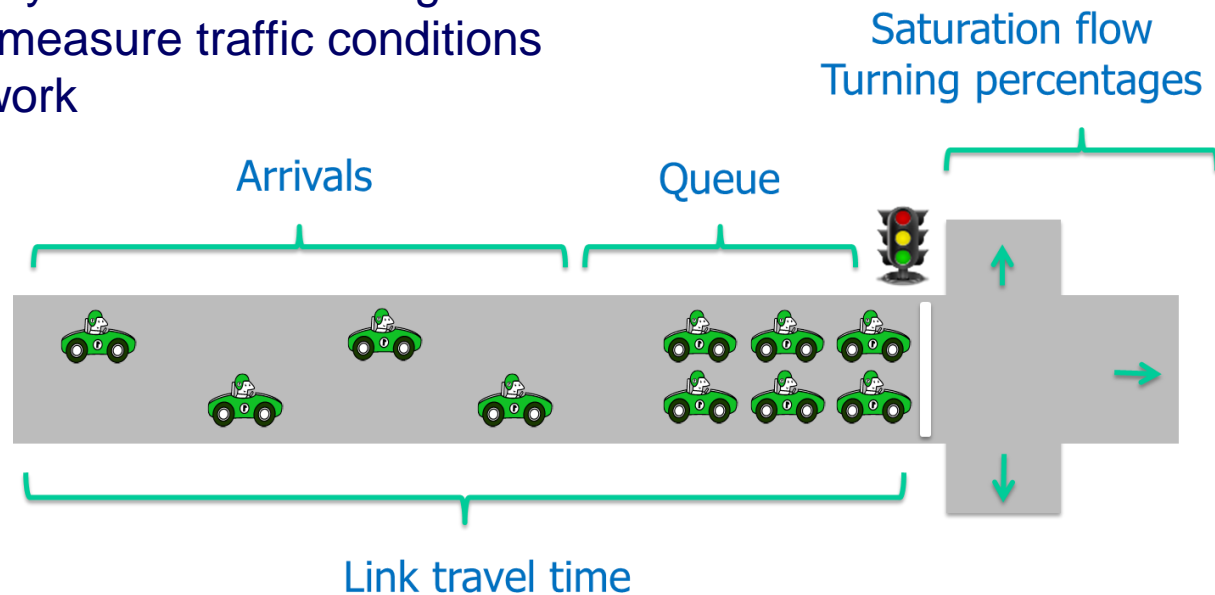


Introduction – Inflow

- Easy import from Vissim, same objects
- Whish list: export to SUMO

What is Inflow?

- Real-time adaptive traffic control system
- Runs on top of existing traffic light controllers
- Aims to improve mobility within the existing infrastructure
- Requires detection to measure traffic conditions
- A communication network





Streets & connectors – nodes & edges (1/3)

- Vissim uses streets (can span multiple intersections)
- Intersections just consist of connectors and streets
- Imflow has the same information in XML format

```
LINK    111 NAME "" LABEL 0.00 0.00
        BEHAVIORTYPE    1 DISPLAYTYPE    1
        LENGTH    12.659 LANES    1 LANE WIDTH    3.50 GRADIENT    0.00000 COST    0.00000
        FROM    2196.640 926.585
        TO    2209.263 925.632
```

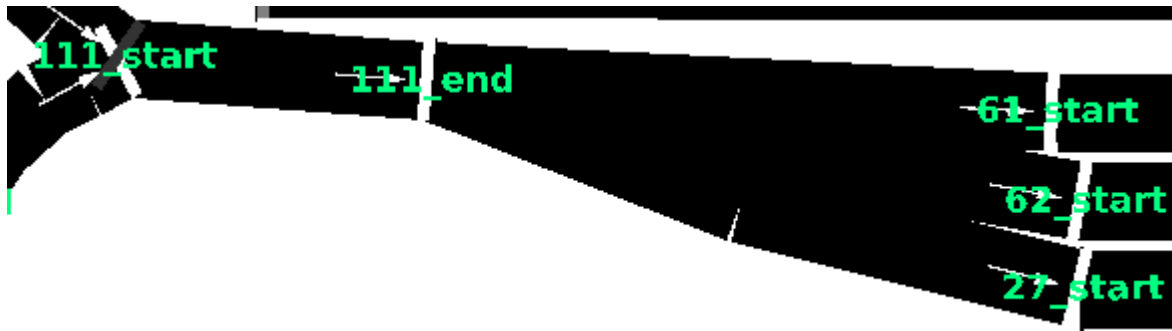
- SUMO starts with nodes
- Edges connect between nodes

```
<node id="111_start" x="2196.64" y="926.585" />
<node id="111_end" x="2209.263" y="925.632" />
```

```
<edge id="111" from="111_start" to="111_end" spreadType="center" />
```



Streets & connectors – nodes & edges (2/3)



```
<edge id="10167" from="111_end" to="27_start" shape="2209.263,925.632  
2221.886,920.63 2235.889,917.116 " spreadType="center" />
```

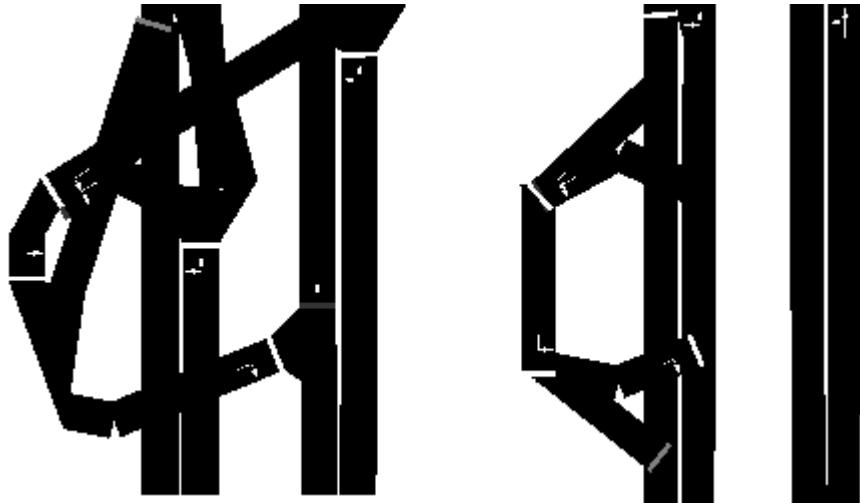
- Optional “OVER” fields in Vissim can be added to “shape” of edge
- Number of lanes can be copied



Streets & connectors – nodes & edges (3/3)

- Use netconvert from edg.xml and nod.xml to net.xml
- Options --offset.disable-normalization, --no-turnarounds and --no-internal links
- Conversion still not accurate

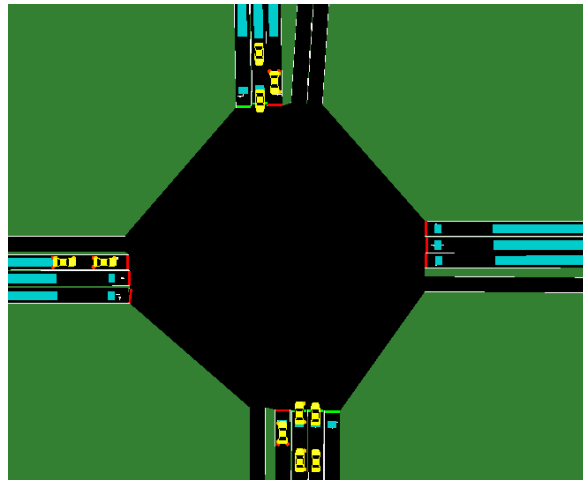
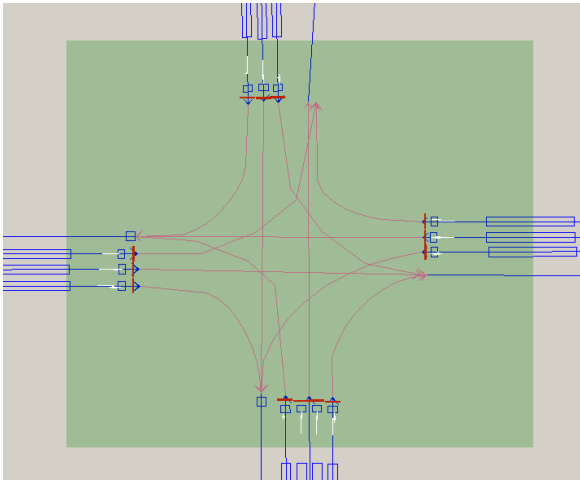
```
<node id="113_start" x="2058.636" y="982.16" />
<...shape="2058.64,981.91 2060.13,937.22".../>
```
- Worse problems with two 2-way streets in close proximity:



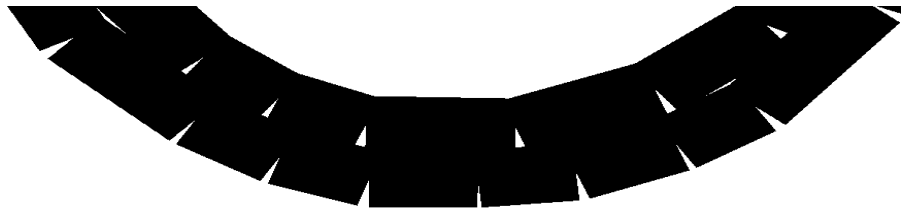


Intersection areas (1/3)

- Intersection area polygon in Imflow configurator
- All connectors will become internal lanes
- Signal heads at transition from street to connector



- Uncontrolled intersections as small as possible, mostly aesthetic





Intersection areas (2/3)

- Original connector from incoming edge to via lane is removed:

```
<connection from="1" to="10001" fromLane="0" toLane="0" dir="s" state="M"/>
```

- New connection from 1 to 16 via 10001 is added:

```
<connection dir="l" from="1" fromLane="0" linkIndex="0" state="o" tl="45"  
to="16" toLane="0" via="10001_0"/>
```

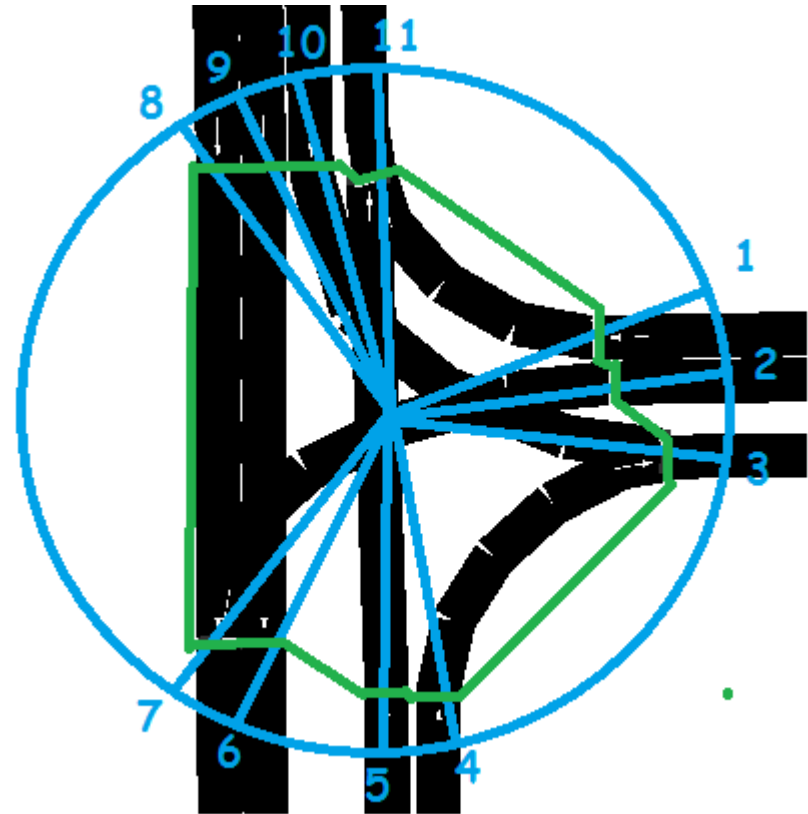
- Connector from 10001 to 16 is kept
- Turn direction calculated using heading difference
- XML translation table is made to translate linkIndex to signal group number (previous presentation)

```
<intersection id="37">  
  <signalgroup id="37000" sumoSGs="7"/>  
  <signalgroup id="37001" sumoSGs="19"/>  
  .  
  .  
  <signalgroup id="37019" sumoSGs="24,12"/>  
</intersection>
```



Intersection areas (3/3)

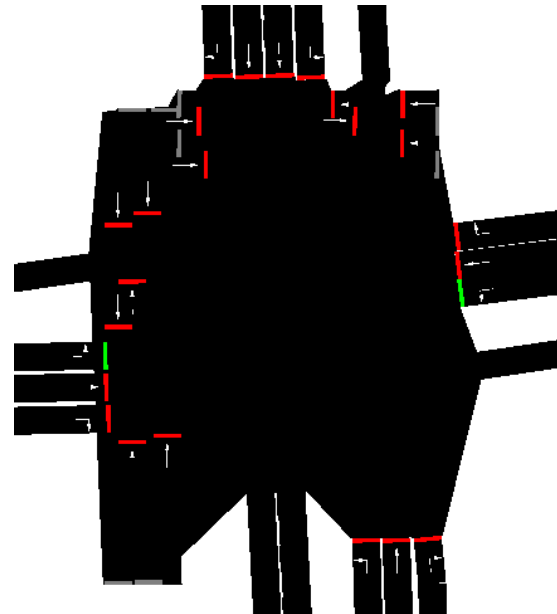
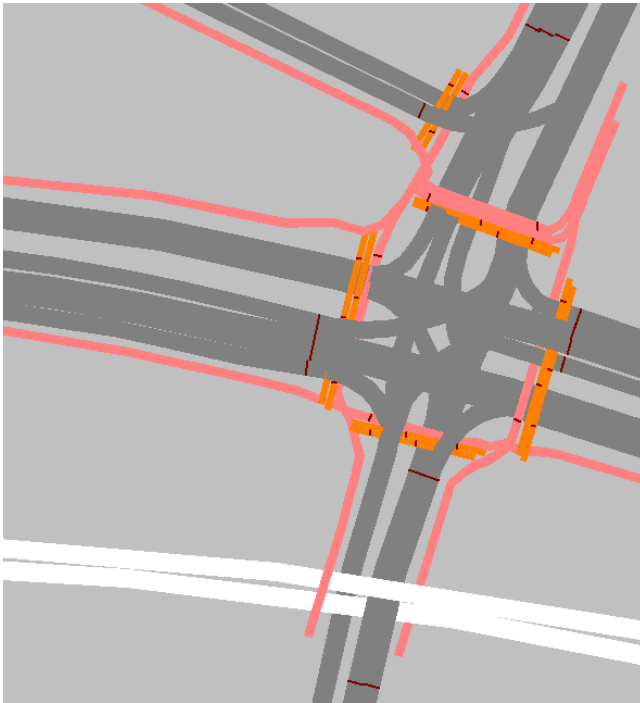
- Drawing the intersection area
- Clockwise ordering
- Endpoints of incoming edges
- Startpoints of outgoing edges
- Resulting area indicated in green
- Right of way rules are cleared (netconvert)





Signal groups and detectors

- Length and location of detectors can simply be copied (E2)
- Signal groups are at the end of an edge
- More complex intersections require 2 junction areas (not yet implemented)
- Pedestrians modelled as small vehicles will improve at 0.21.0





Other network formats

- Aimsun doesn't have a human readable network file format
- The TEDI part is human readable and describes the geometry
- First converting to Vissim may be an option

- Paramics has a human readable format
- Uses a similar node-edge structure
- Curves described as arc, requires shape segment recalculation



Conclusion

- Direct conversion no manual editing
- Integration with traffic light controller
- Lessons learned applicable to other future convertors

Future work:

- Complex intersections with multiple junctions
- Right of way rules (partial conflicts)



Questions

