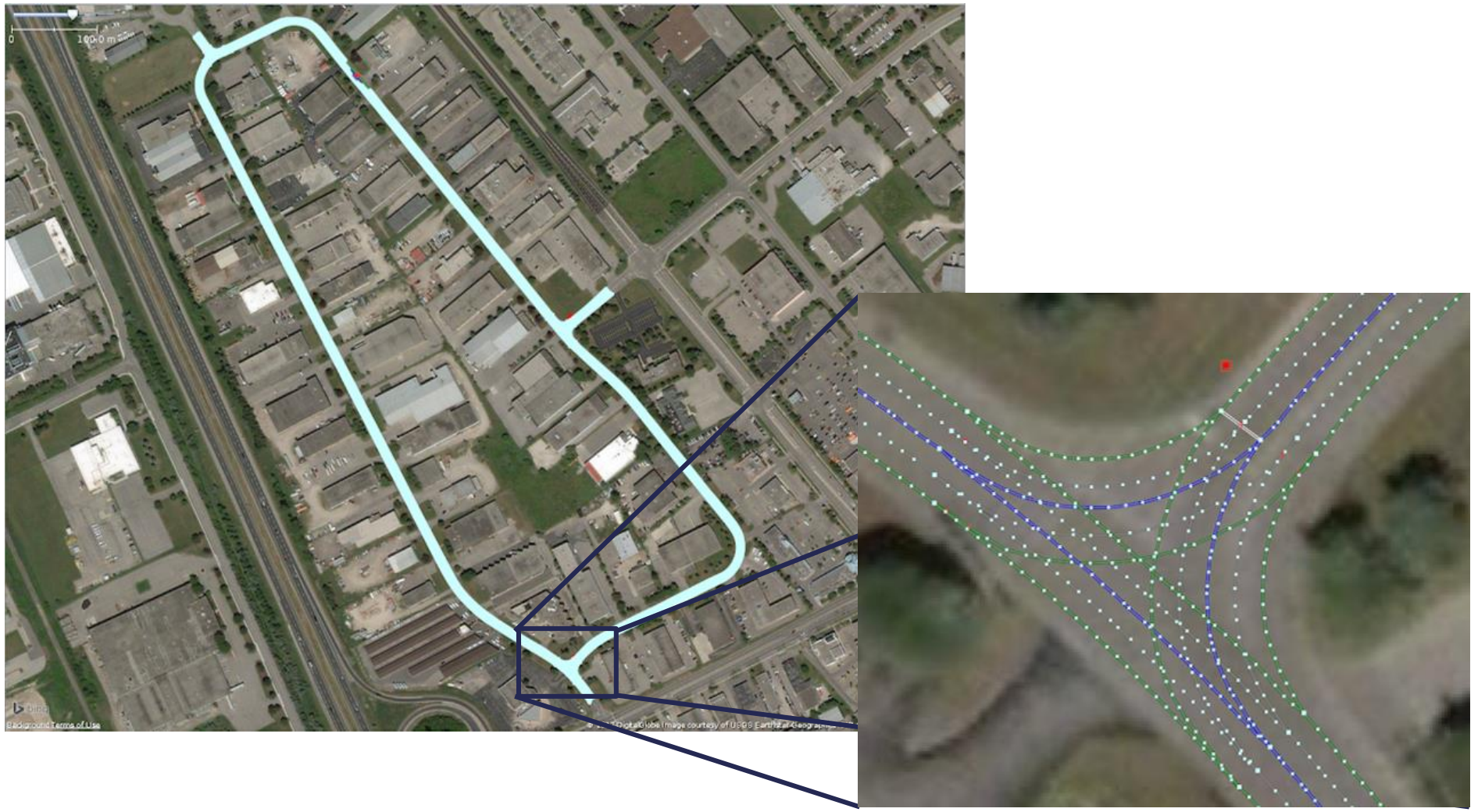
High Definition Road Maps

Course 4, Module 2, Lesson 4

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

High Detailed Road Map

locations (all lanes down to cm accuracy).
road signs & signals

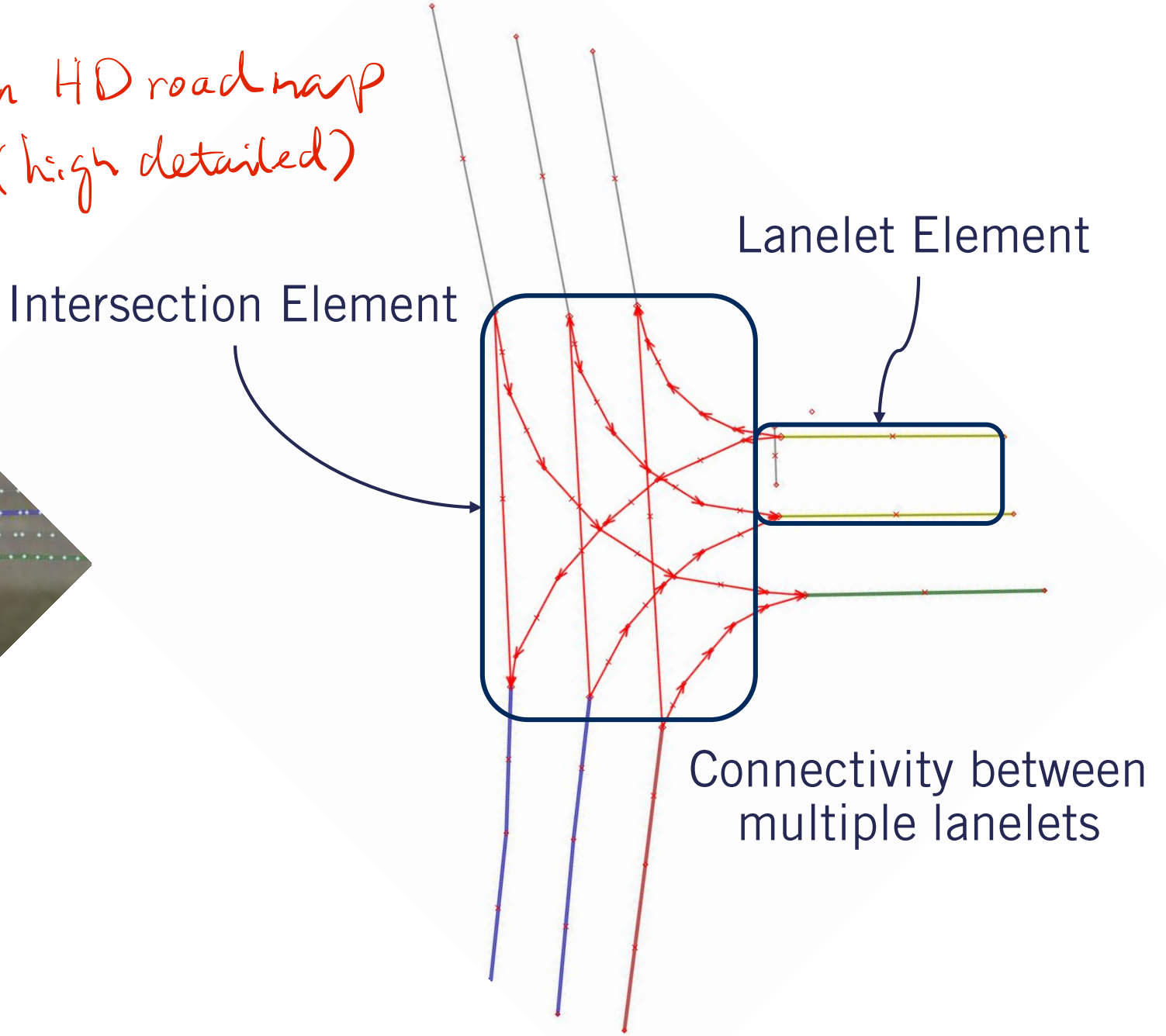


Lanelets: Efficient Map Representation for Autonomous Driving

Philipp Bender, Julius Ziegler and Christoph Stiller*

Lanelet Map

an HD roadmap (high detailed)

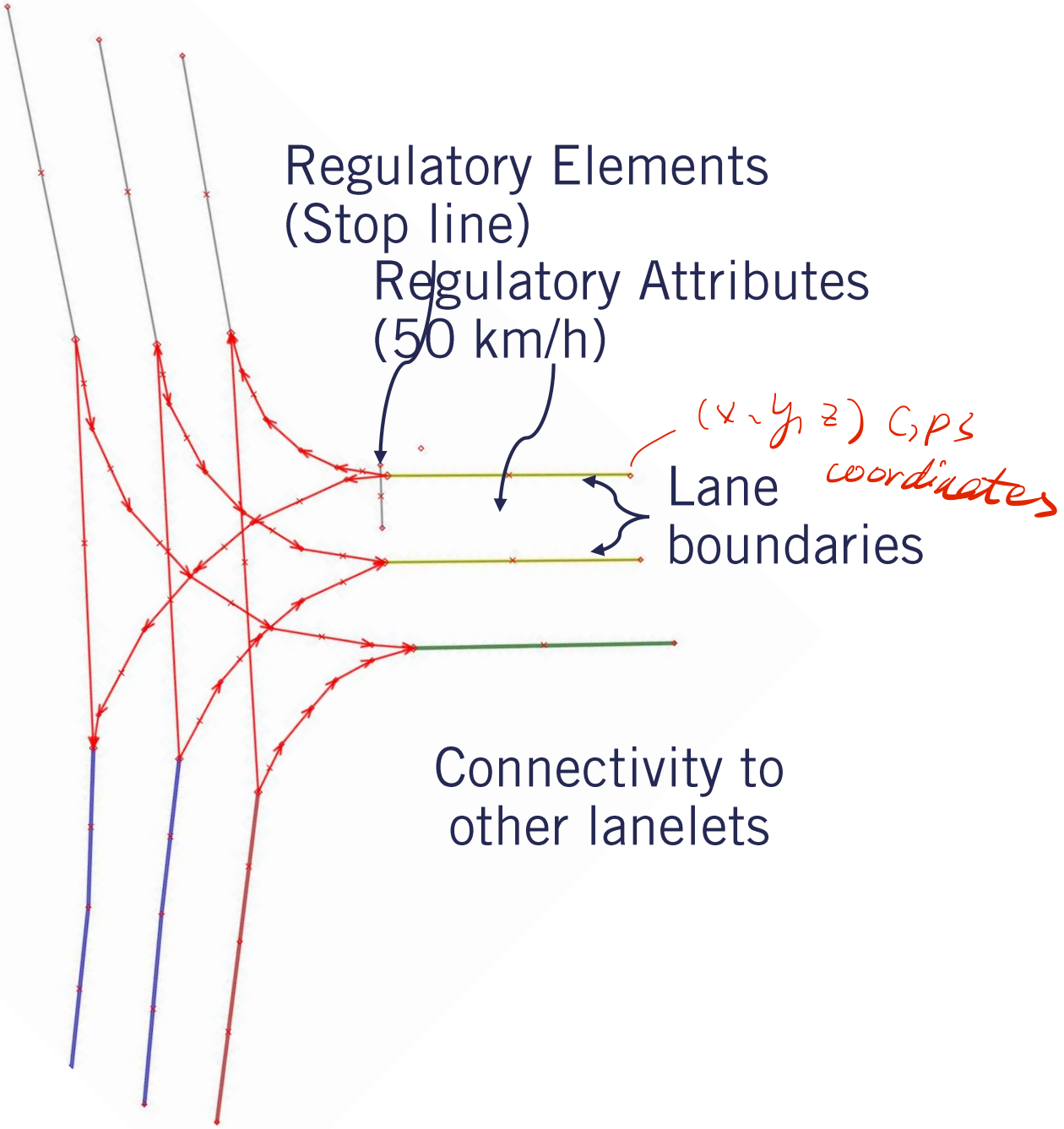


Lanelet Element

- Defines the following:
  - Left and Right Boundaries
  - Regulation (represented as lines)
    - Elements
    - Attributes (ex. speed limit)
  - Connectivity to other lanelets

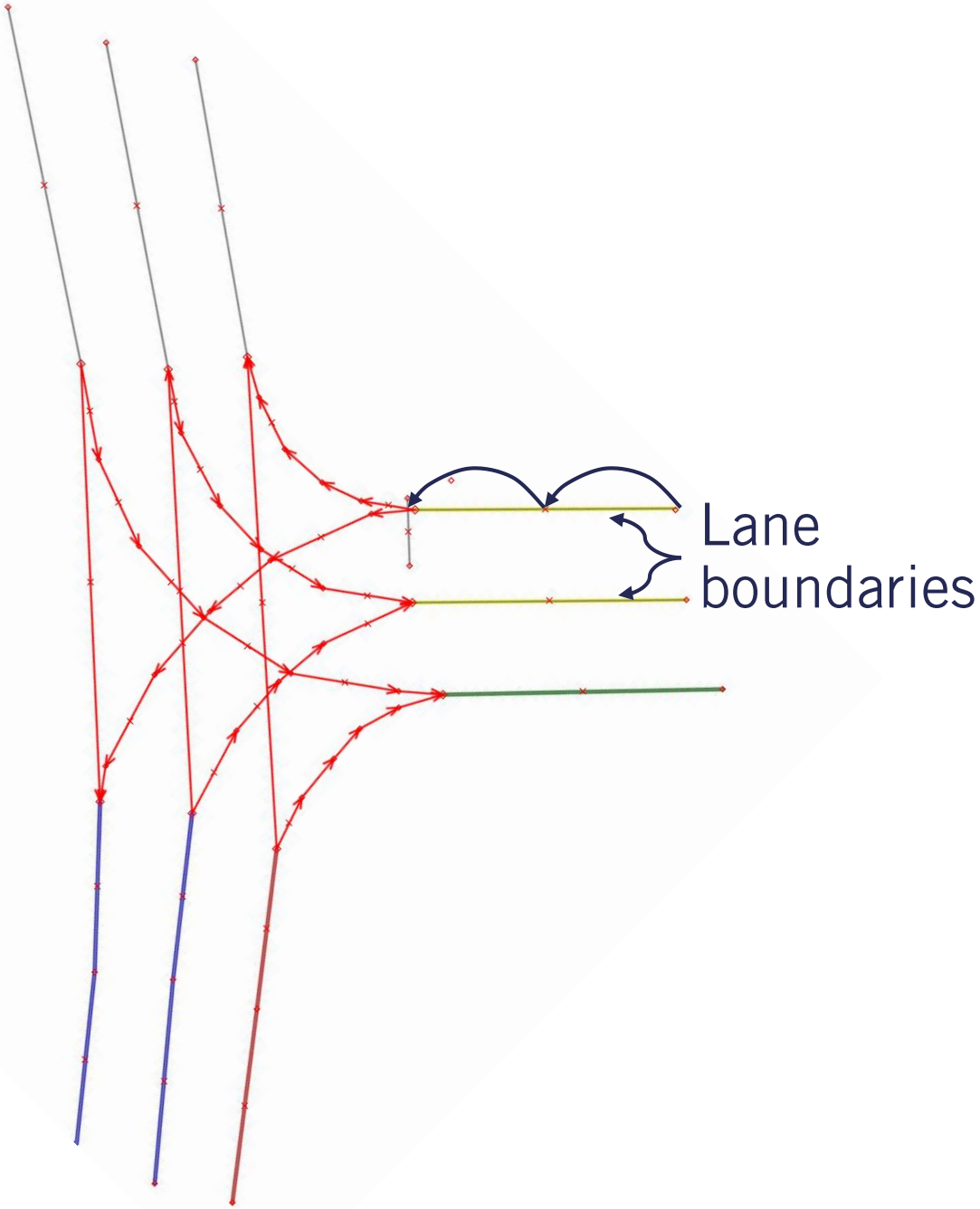
- A new lanelet is created when a new regulatory element is encountered or ends

Can be a few meters or hundreds of meters (highway)



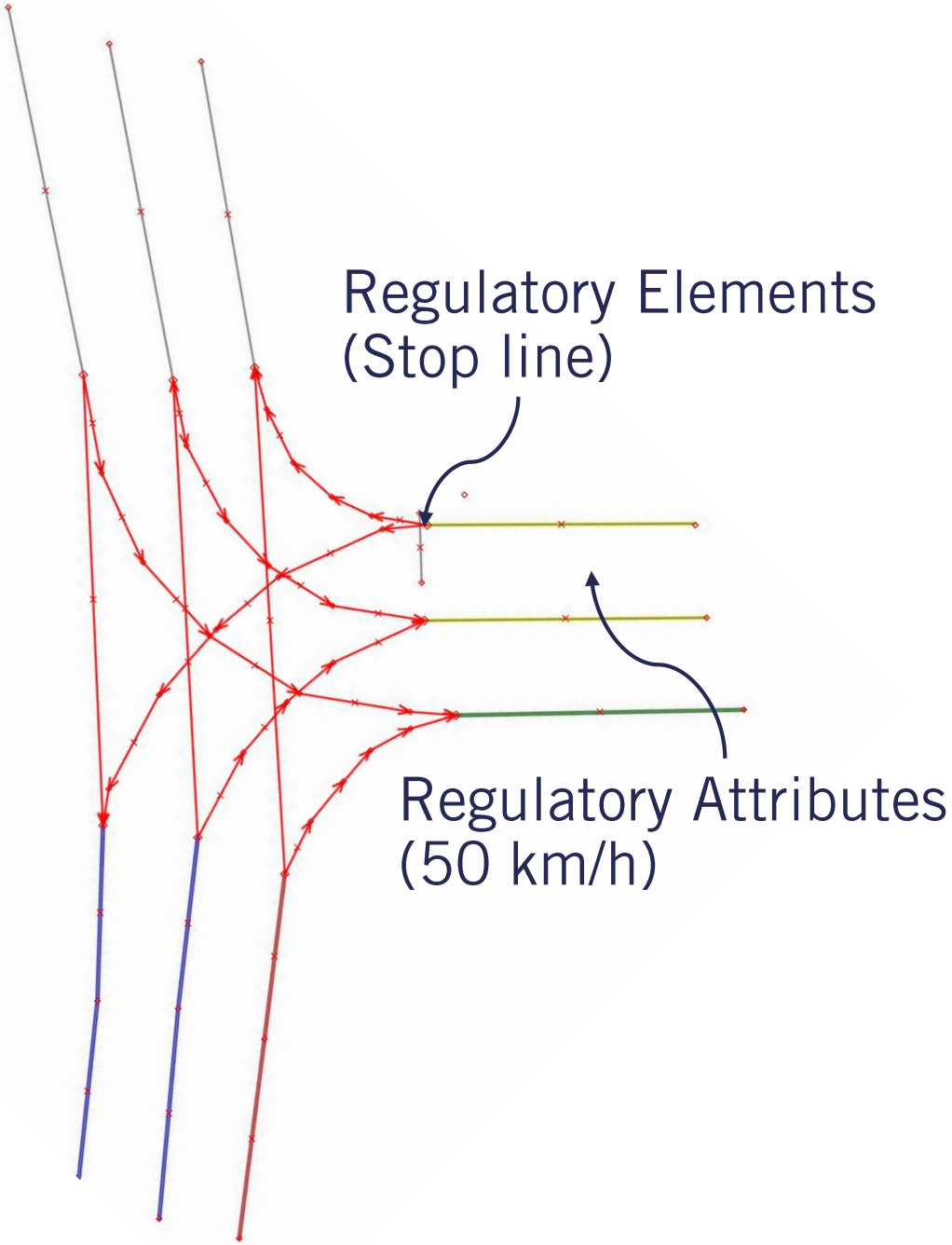
Lanelet Boundaries

- Defines the edges of a driving lane
- A list of pointers points creating a polygonal line
  - X, Y, and Z coordinates
- Different operation can be performed on boundaries:
  - Heading
  - Curvature
  - Center line

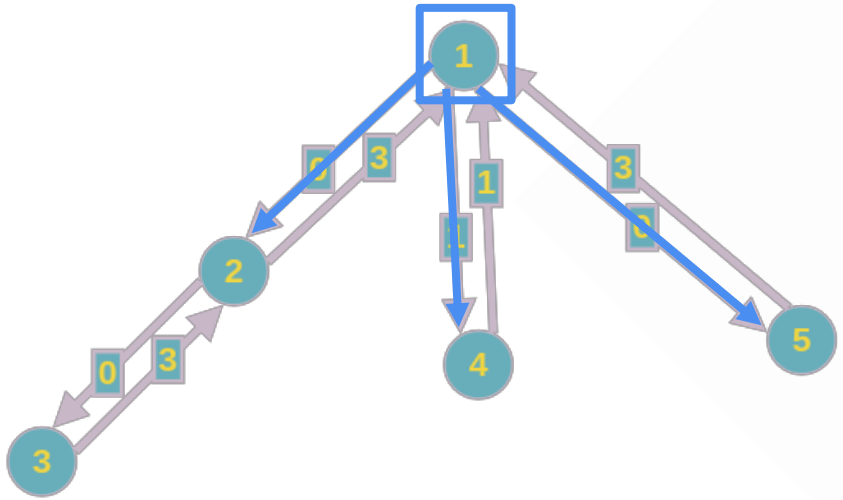


Lanelet Regulations

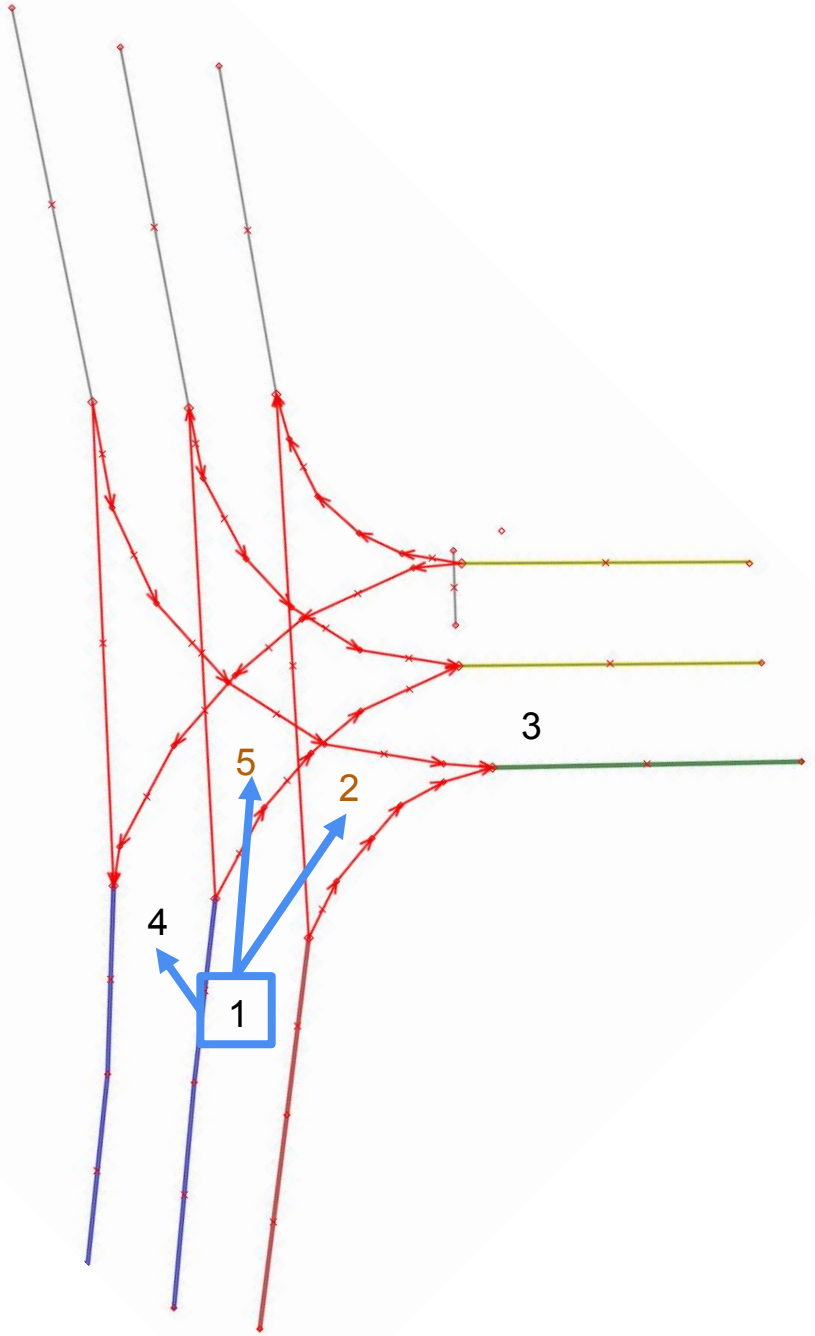
- Elements - a list of points creating a line identifying stop location
  - Stop line
  - Traffic lights line
  - Pedestrian crossings
- Attributes - a set of regulation attributes assigned to a lanelet
  - Speed limit
  - Crossing another lanelet



Lanelet Connectivity

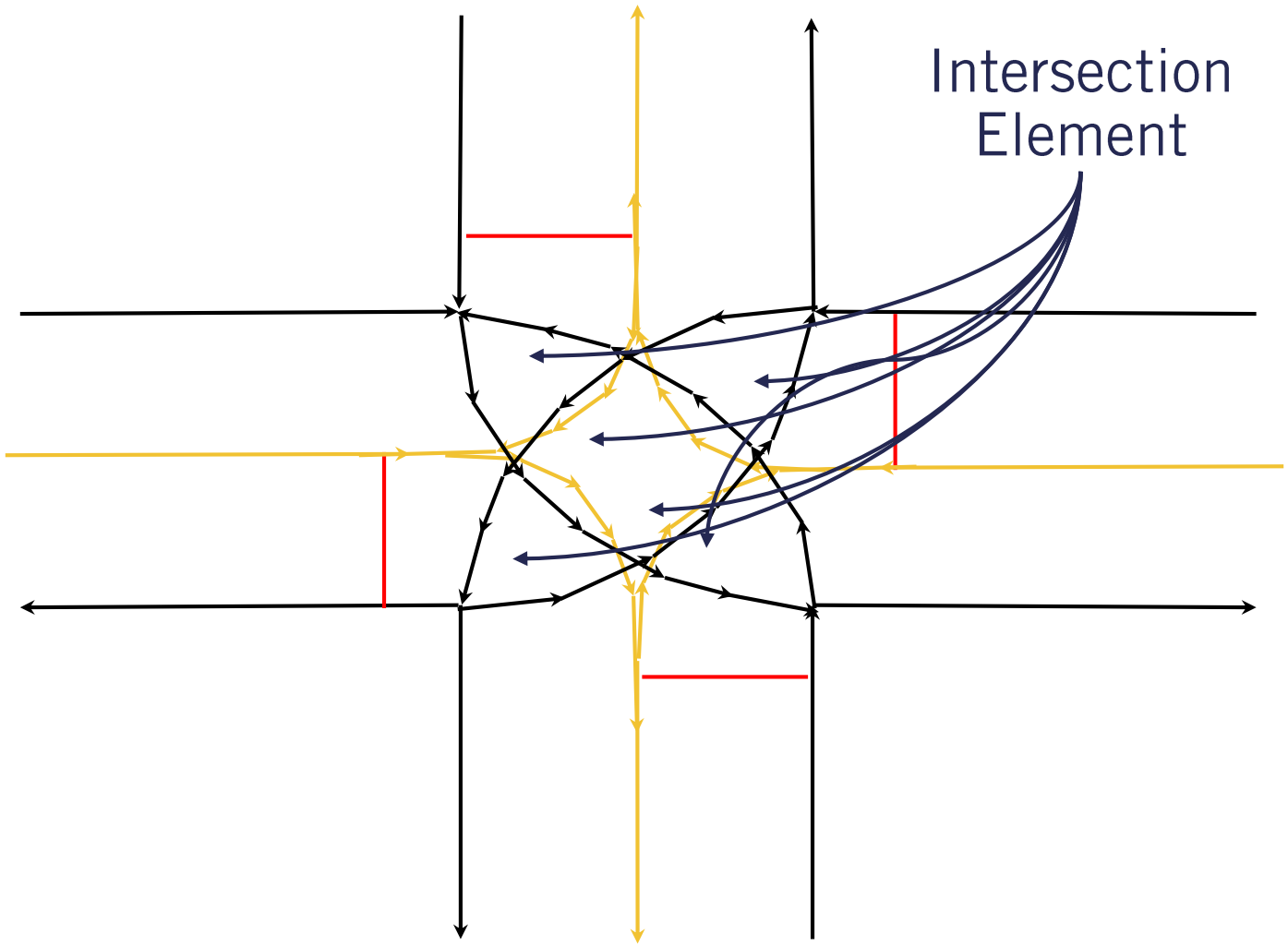


Edges:
0 = next
1 = left
2 = right
3 = previous



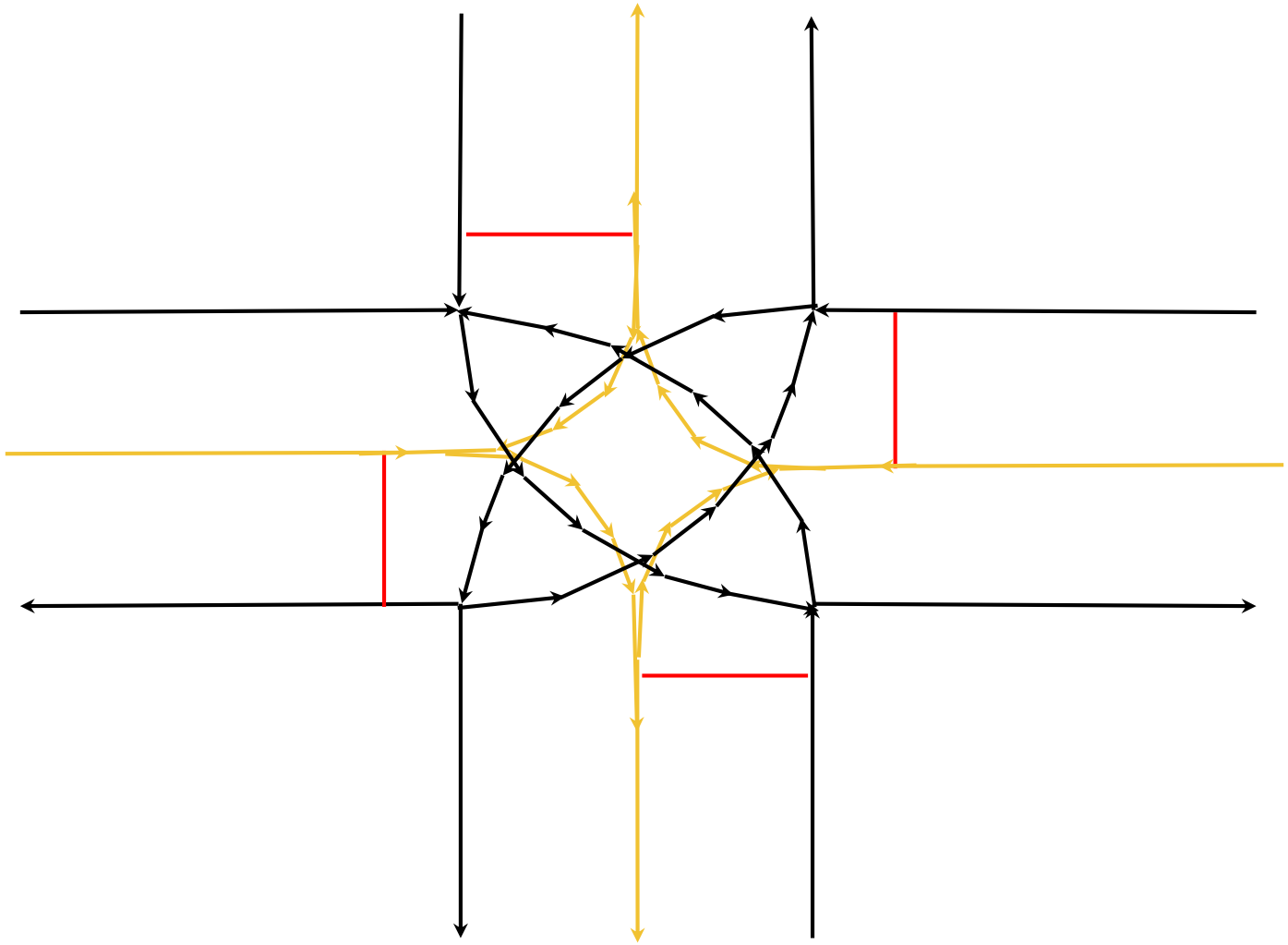
Intersections

- Intersection Element - pointer to all lanelets which are part of an intersection
- Helps with behaviour assignments



Operations Done On Lanelets

- Path planning through complex road networks
- Localize Dynamic Objects
- Interactions with other Dynamic Objects



Creations Of Lanelets

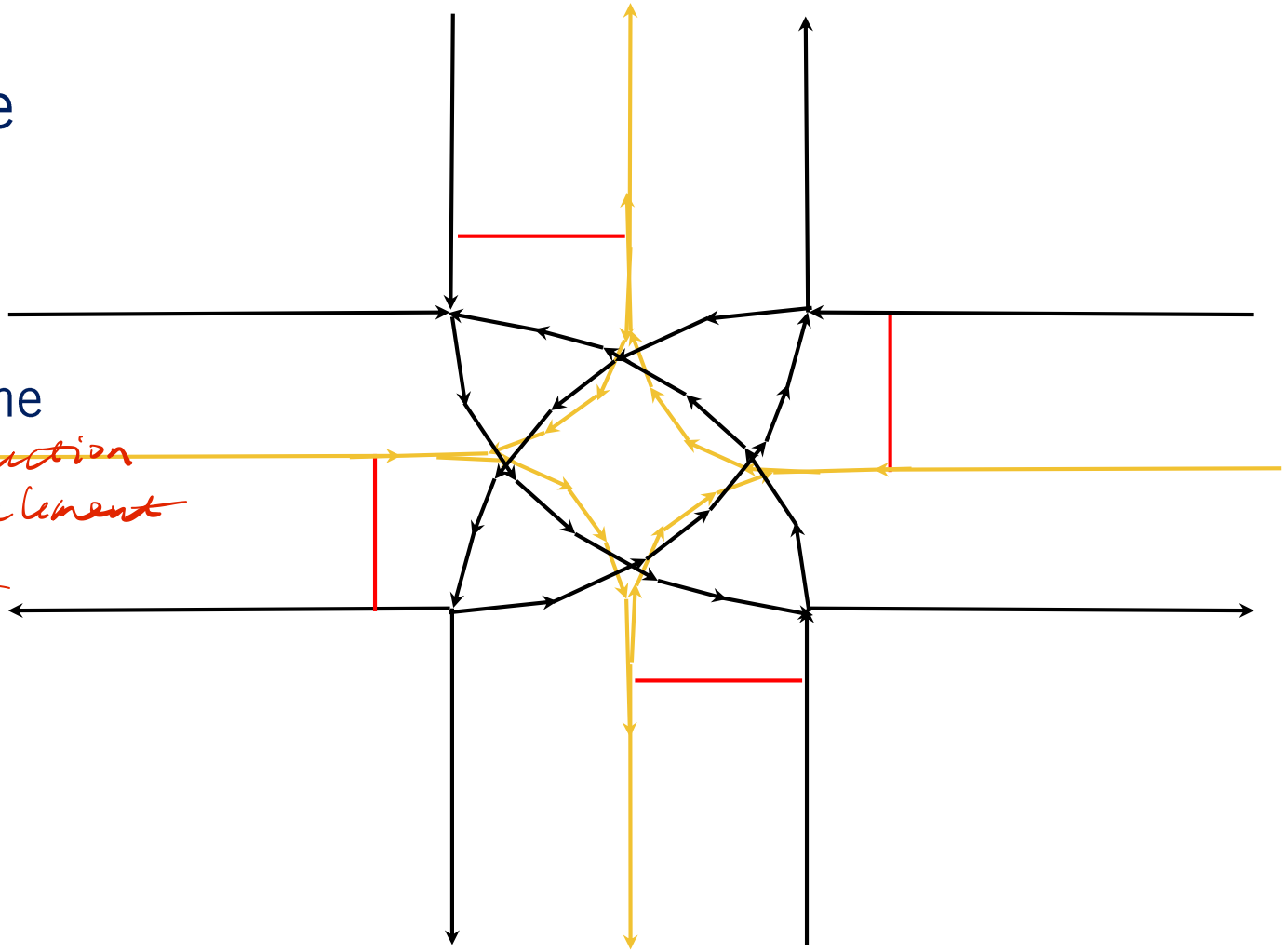
- 3 methods to create the lanelet map
  - Offline creation
  - Online creation
  - Offline creation with online updating

a new construction regulatory element

computationally expensive

- motion planning task
- perception task

rarely used



Summary

- Defining lanelet map
- Defining the elements that make up a lanelet map
  - Lanelet element
  - Intersection element
  - Operations that can be done on lanelets
- Creation of lanelet maps
- Connectivity between lanelets

- Next: Mission Planning