

# Improving Urban Traffic Flow with Drone Supported Vehicular Networks

FINAL TALK BY DMITRIY MONAKHOV

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# Motivation

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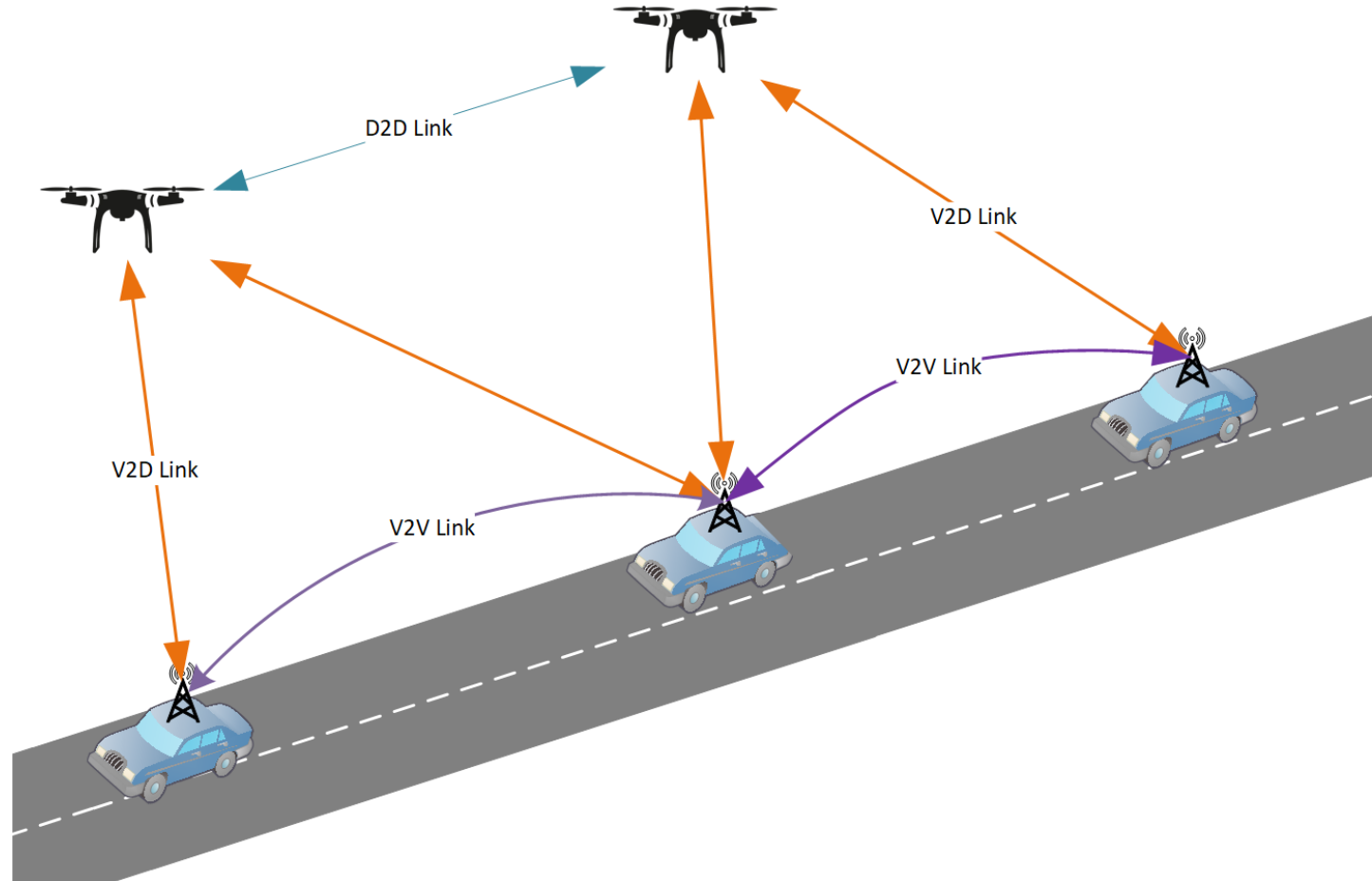
- Most recent works focus on different aspects
- Very few works discuss urban environments



Source: <https://www.unmannedairspace.info/uncategorized/39-cities-pioneering-urban-drone-operations/>

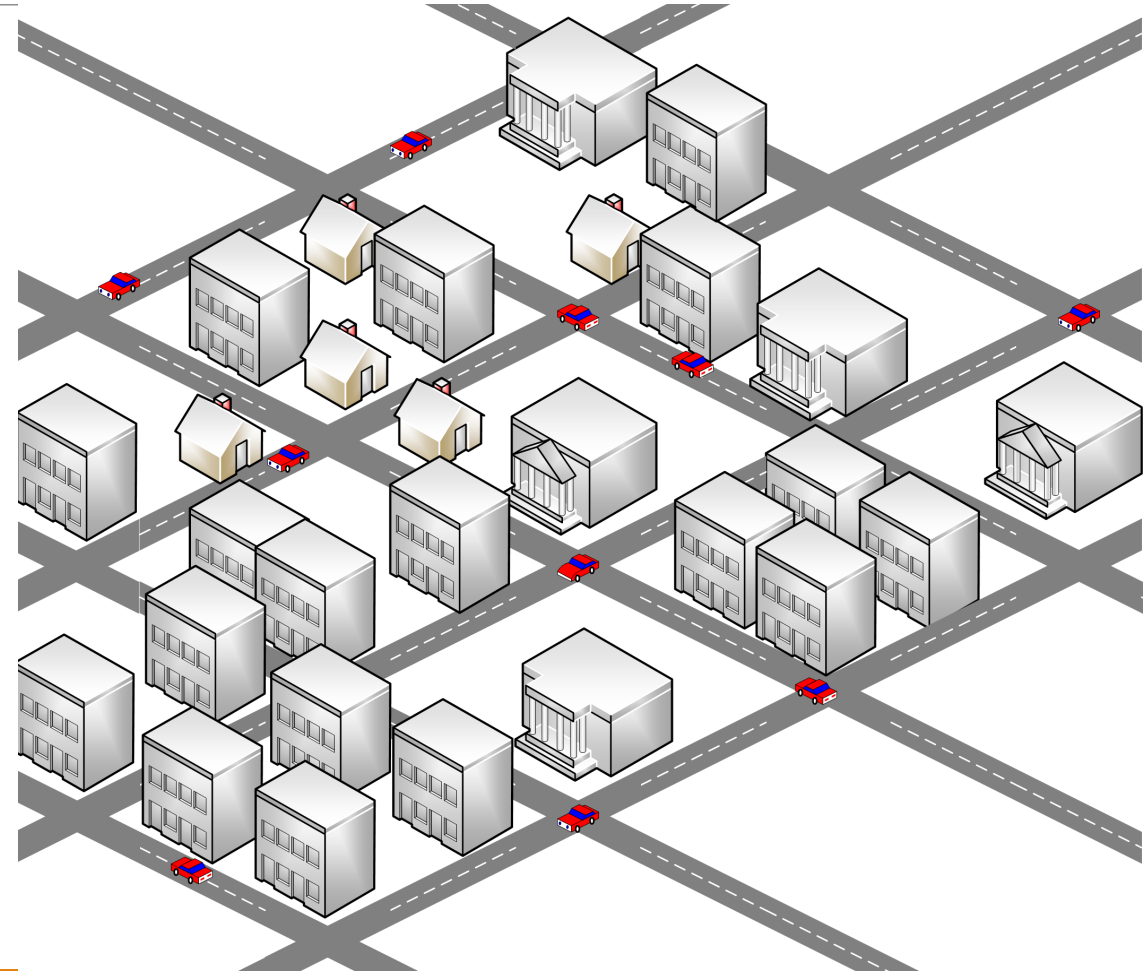
# Goals

- Simulate DAVN in a dense city region
- Simulate traffic jams
- Measure traffic flow with and without drones
- Assess drone effects



# Implementation: setup

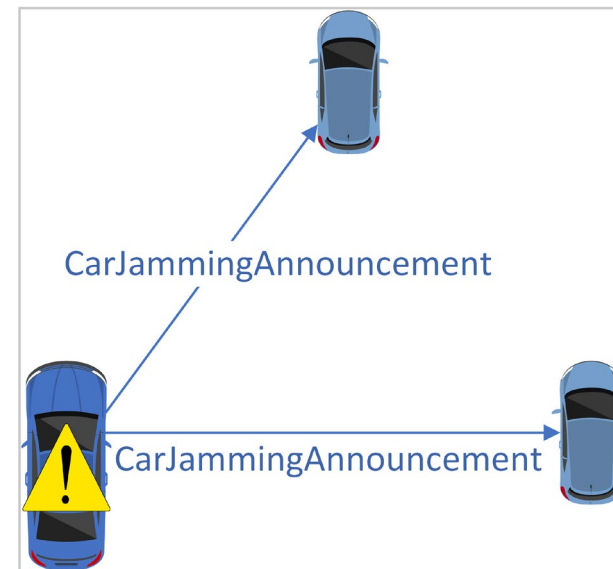
- **Manhattan Grid**
- **Vehicles follow random routes**
- **Some vehicles break down and block the road**
- **Broken vehicles send broadcasts**
- **Other vehicles change route and rebroadcast**



# Implementation: protocol

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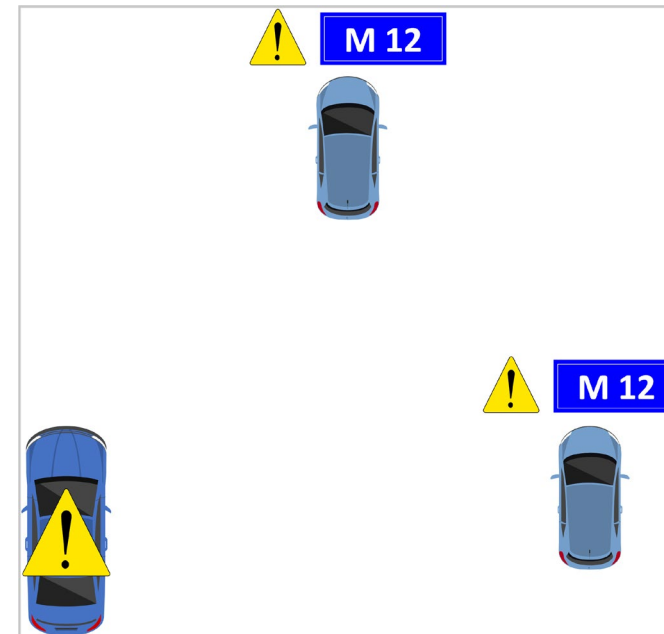
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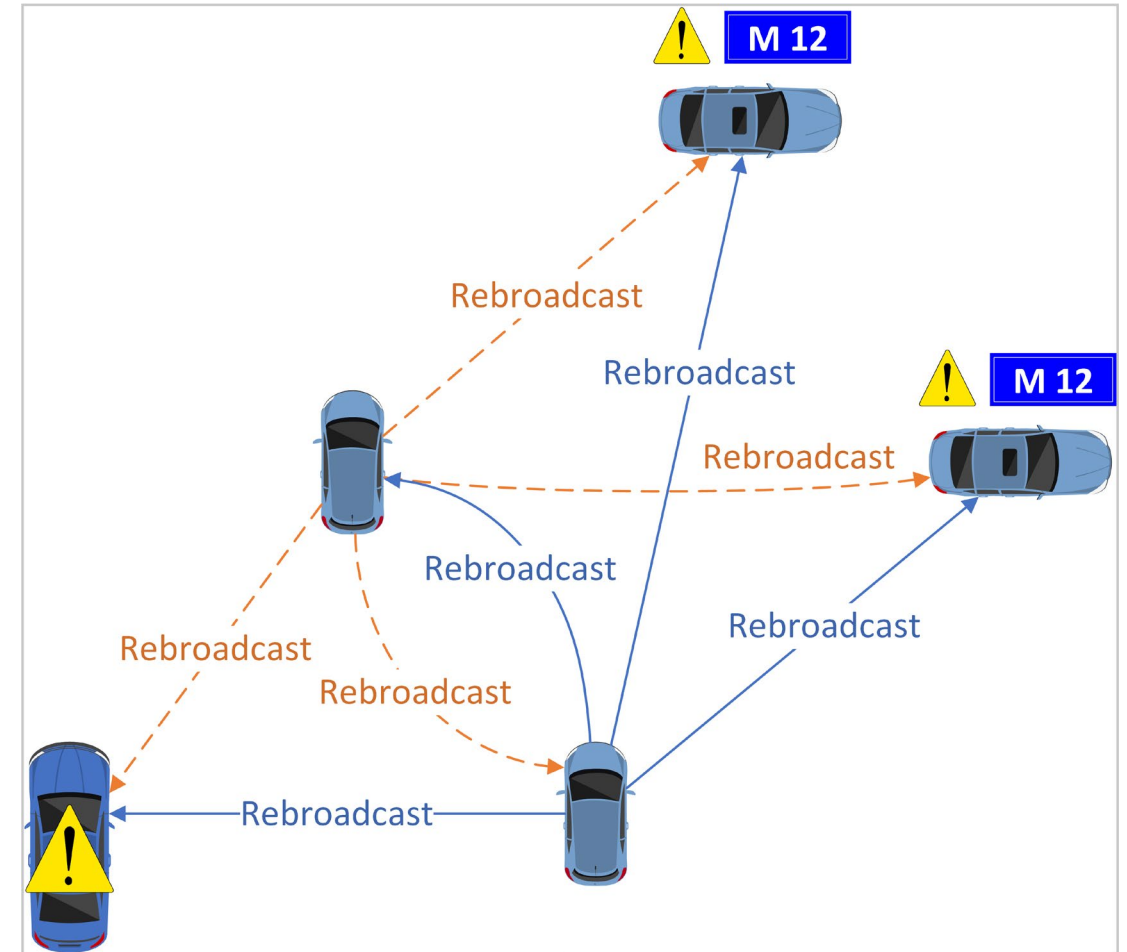
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# Implementation: protocol

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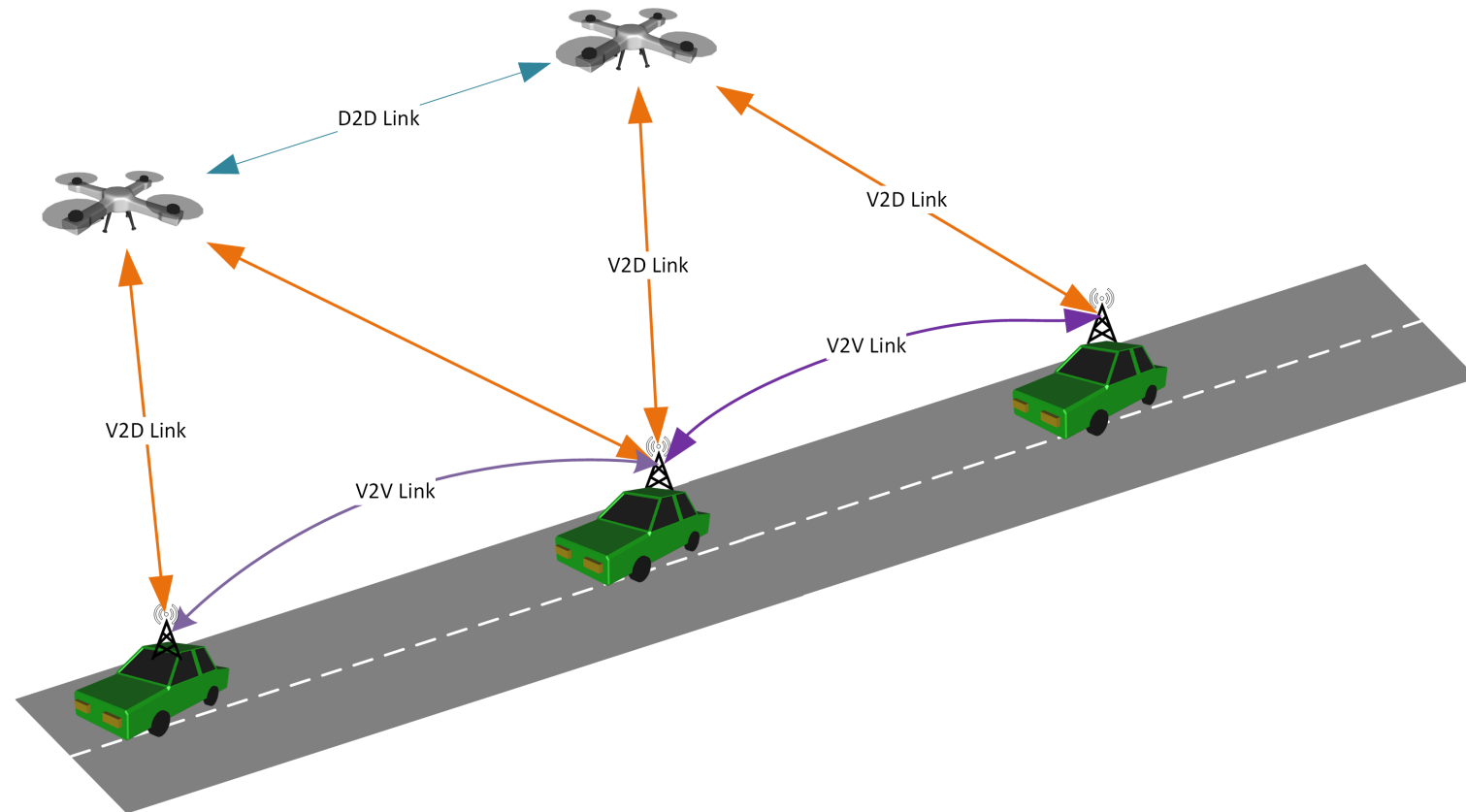


# Implementation: drones

➤ Drones reuse vehicles' protocol

➤ Drones fly opportunistically above buildings (average altitude: 175 m)

➤ Drones rebroadcast messages from vehicles and other drones



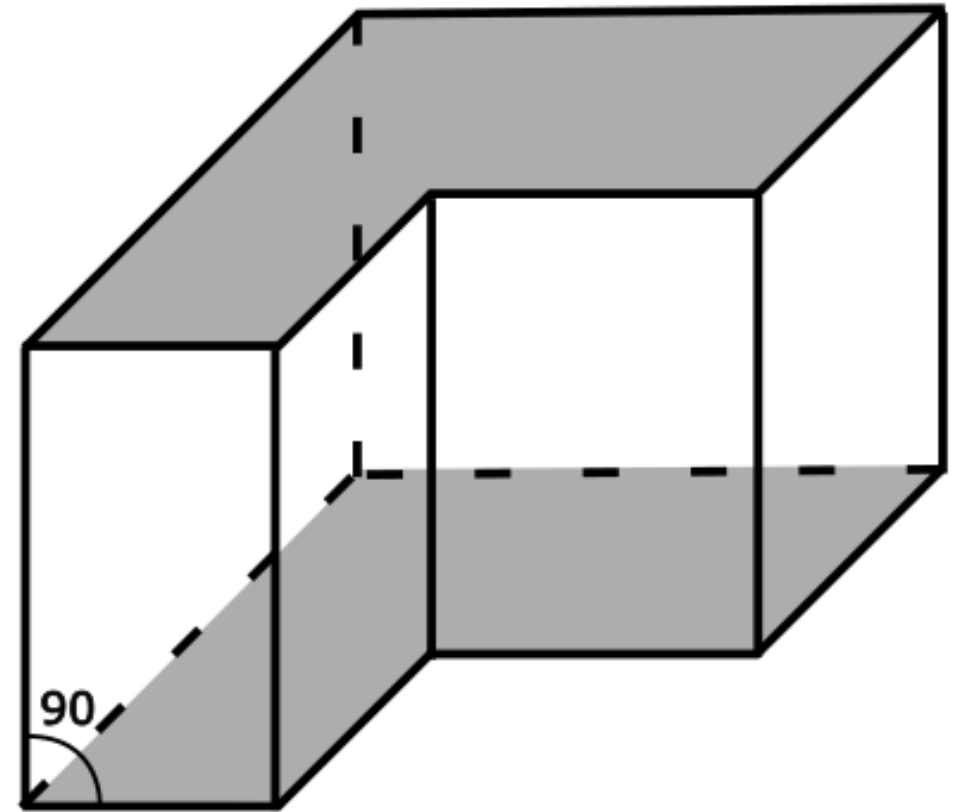




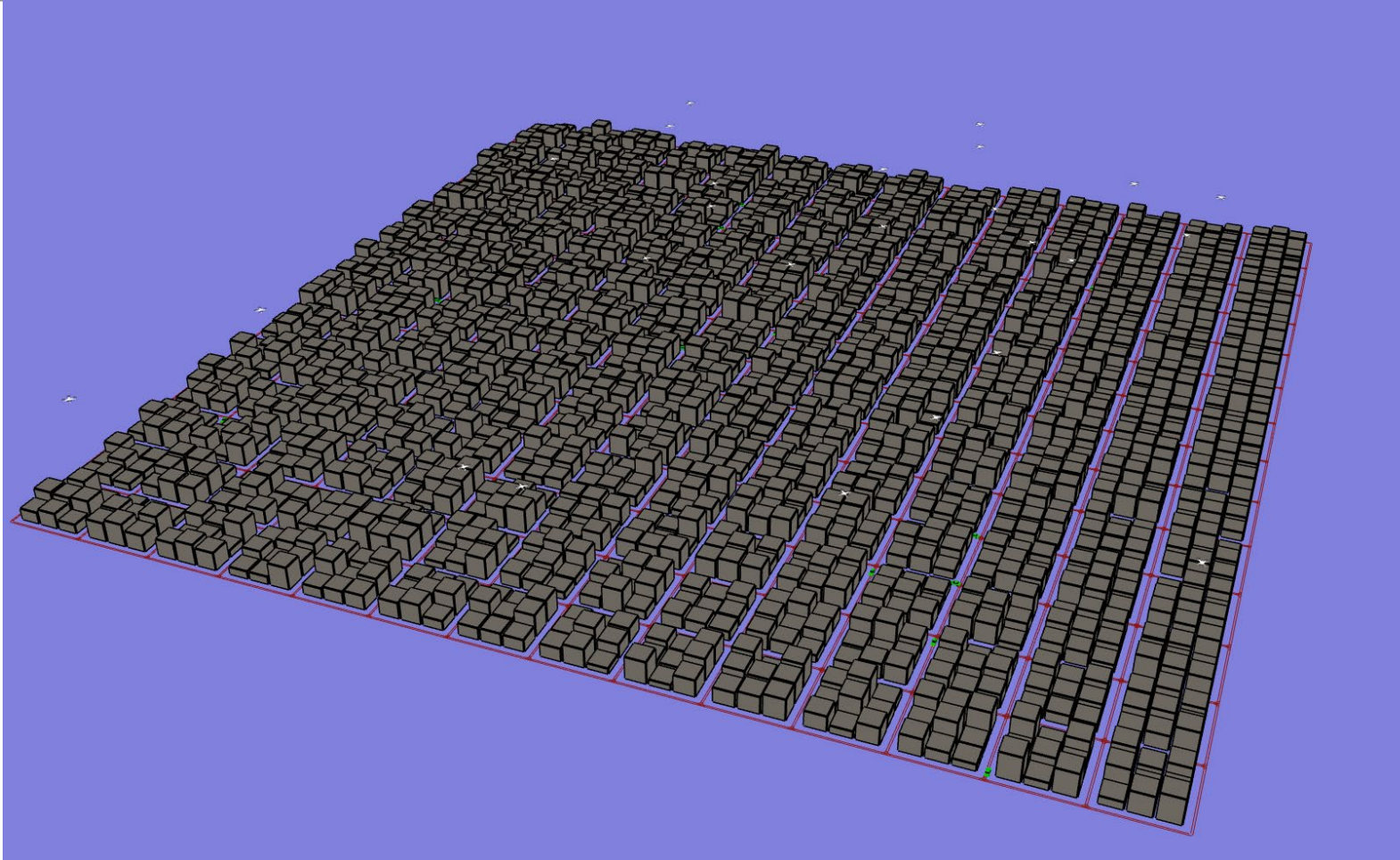
# Implementation: 3D Shadowing

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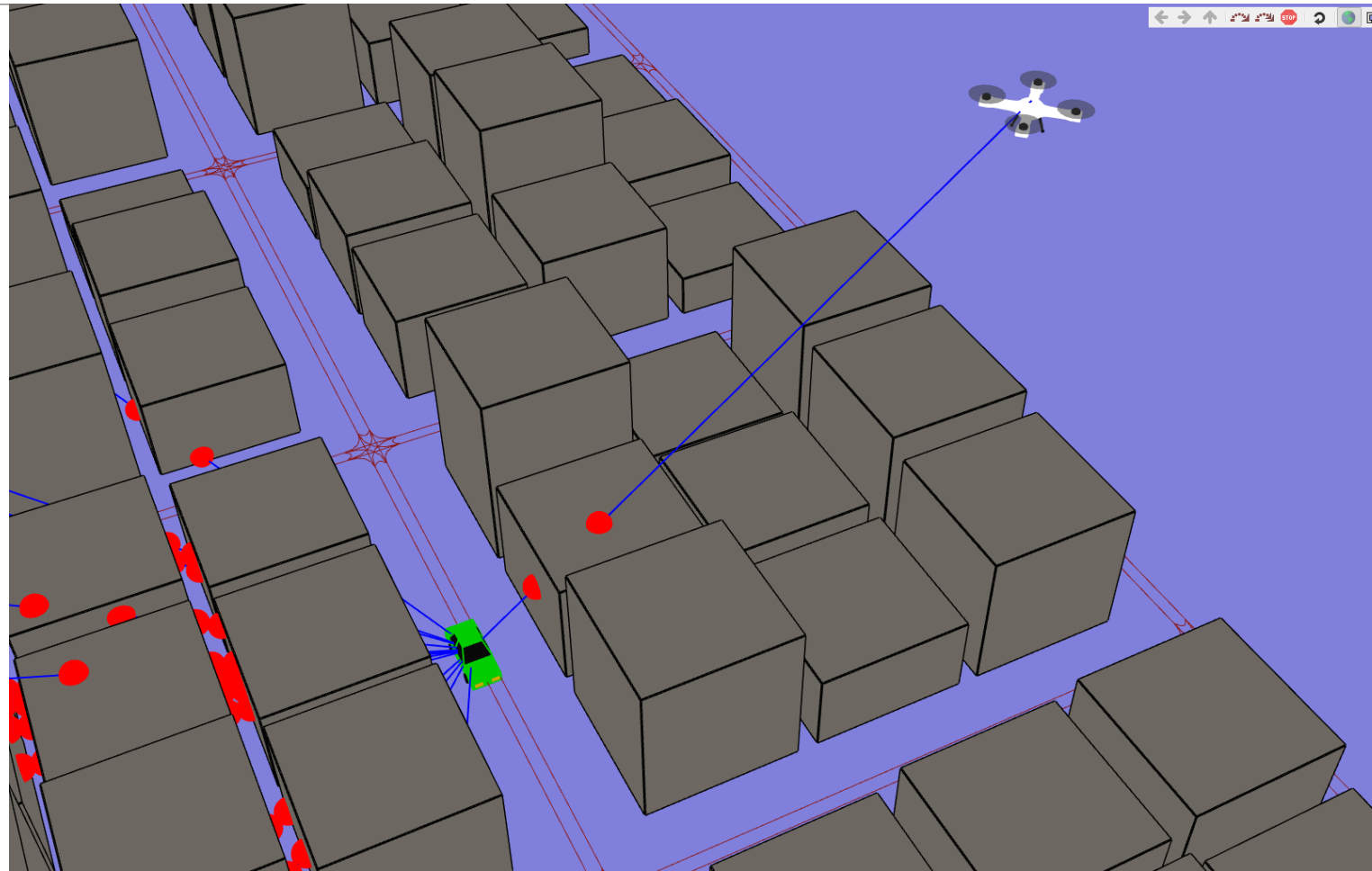
- Buildings are approximated as right prisms
- Calculates line-prism intersection points
- Reuses existing Veins infrastructure



# Implementation: visualization

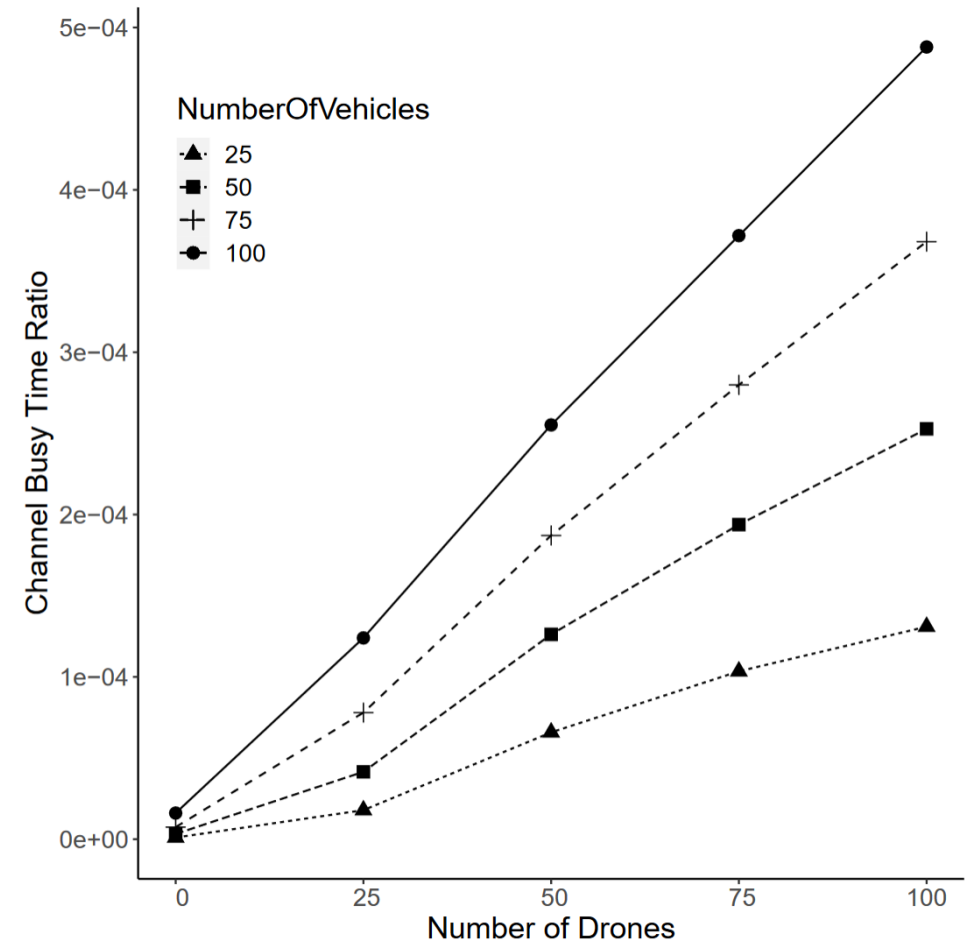


# Implementation: visualization

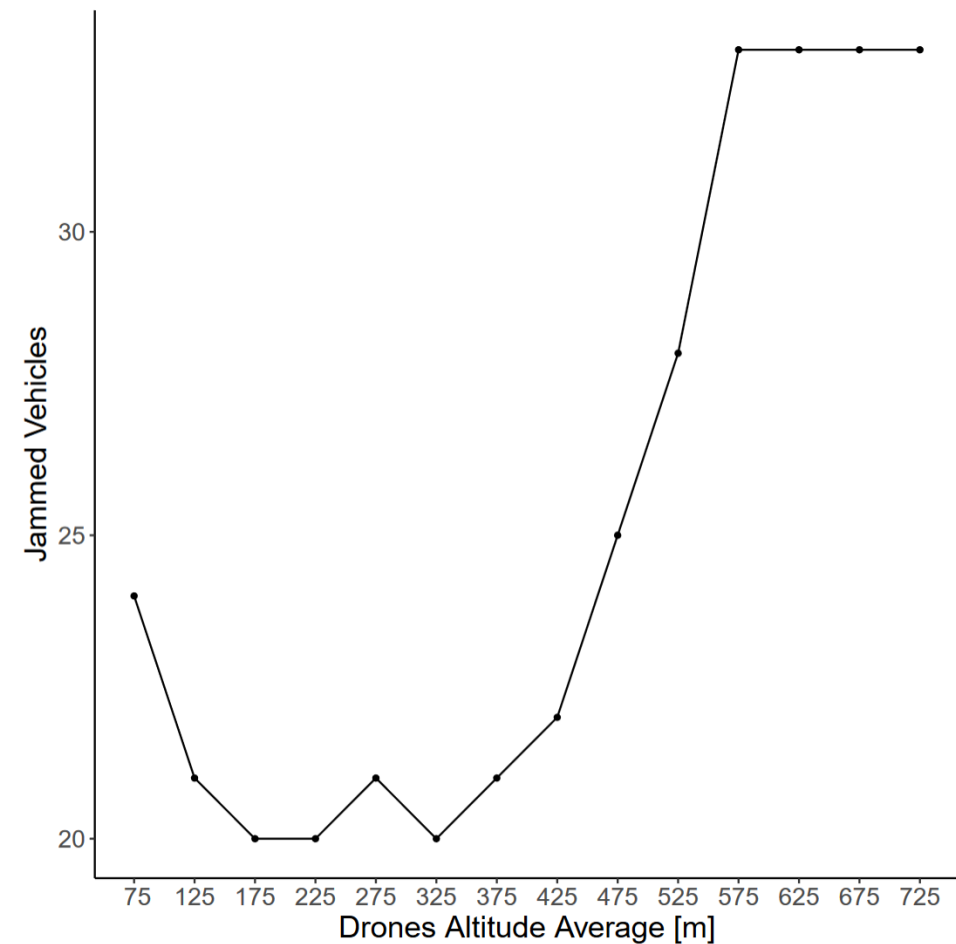
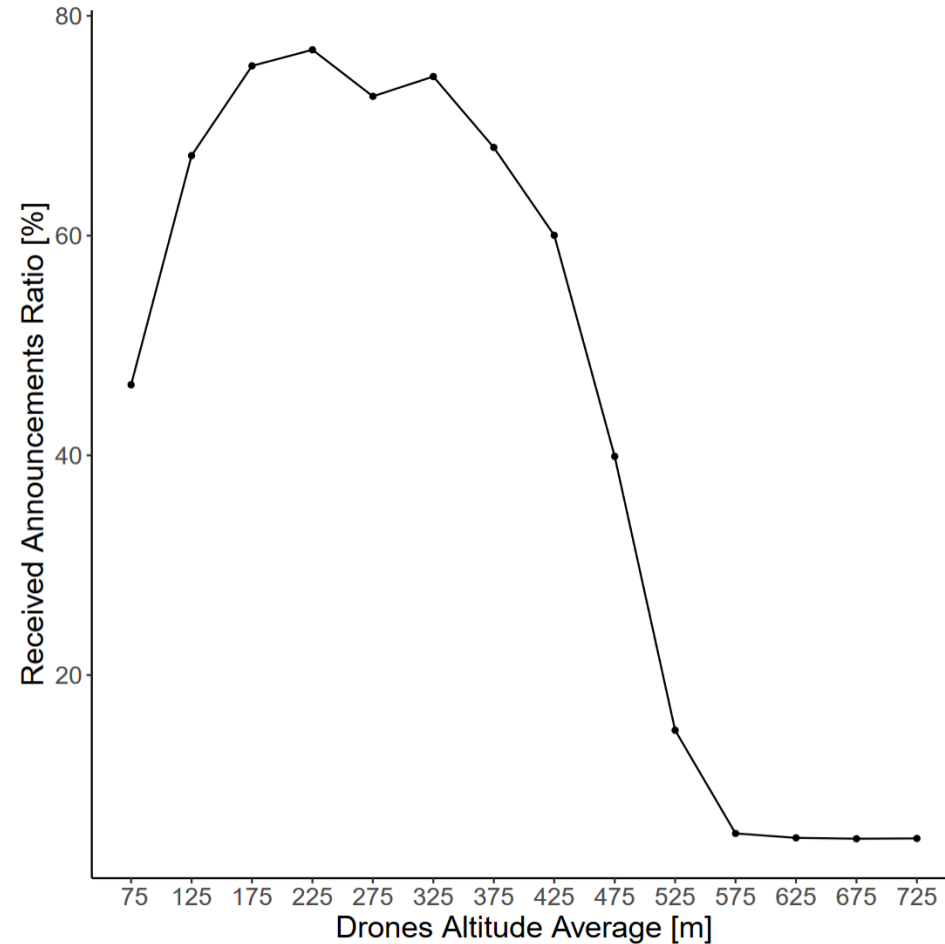


# Broadcast storm suppression

- Weighted p-persistence algorithm
- Different parameters for drones and vehicles
- **Channel busy-time ratio low in all cases**

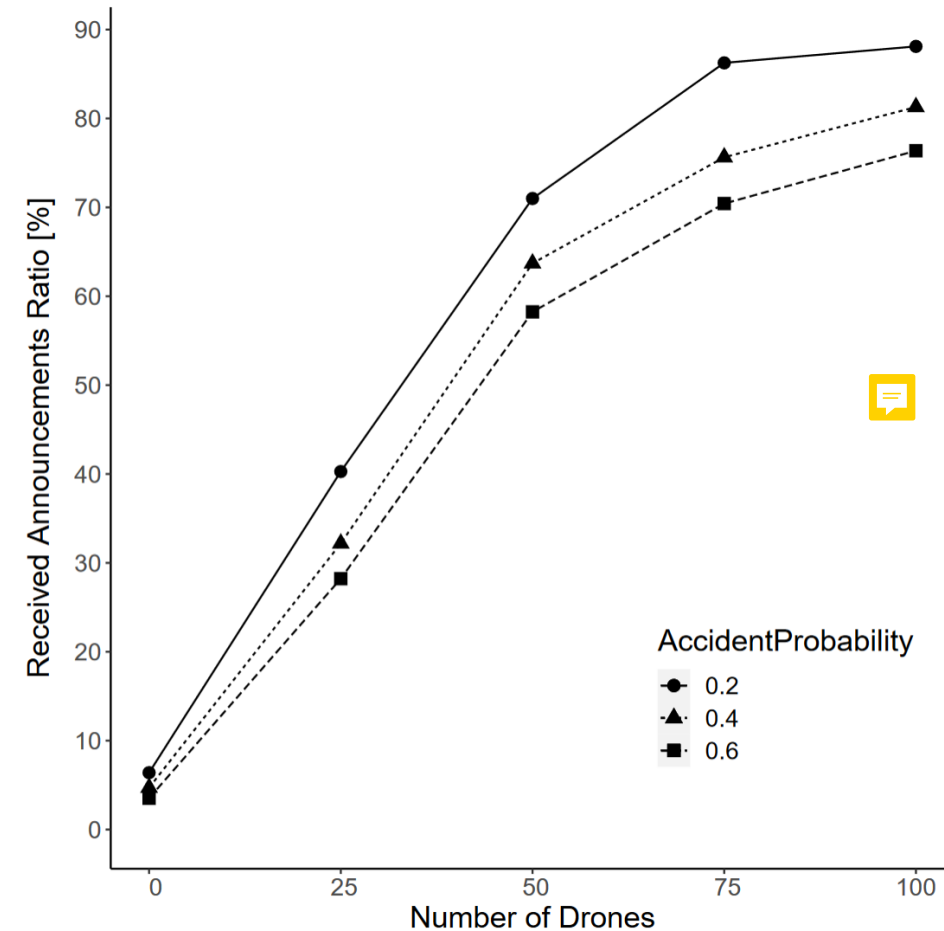


# Drone flight altitude



# Evaluation

- Can be used as connectivity metric
- Connectivity increases when number of drones is rising
- Accident probability has negative impact





# Evaluation: traffic flow improvement

Accident probability is fixed: 30%

