

DEMONSTRATION OF THE WNTR PACKAGE CAPABILITIES

*The fundamentals of building a water
network with optimal resilience*

Delivered by 2201AC Internship Team 17

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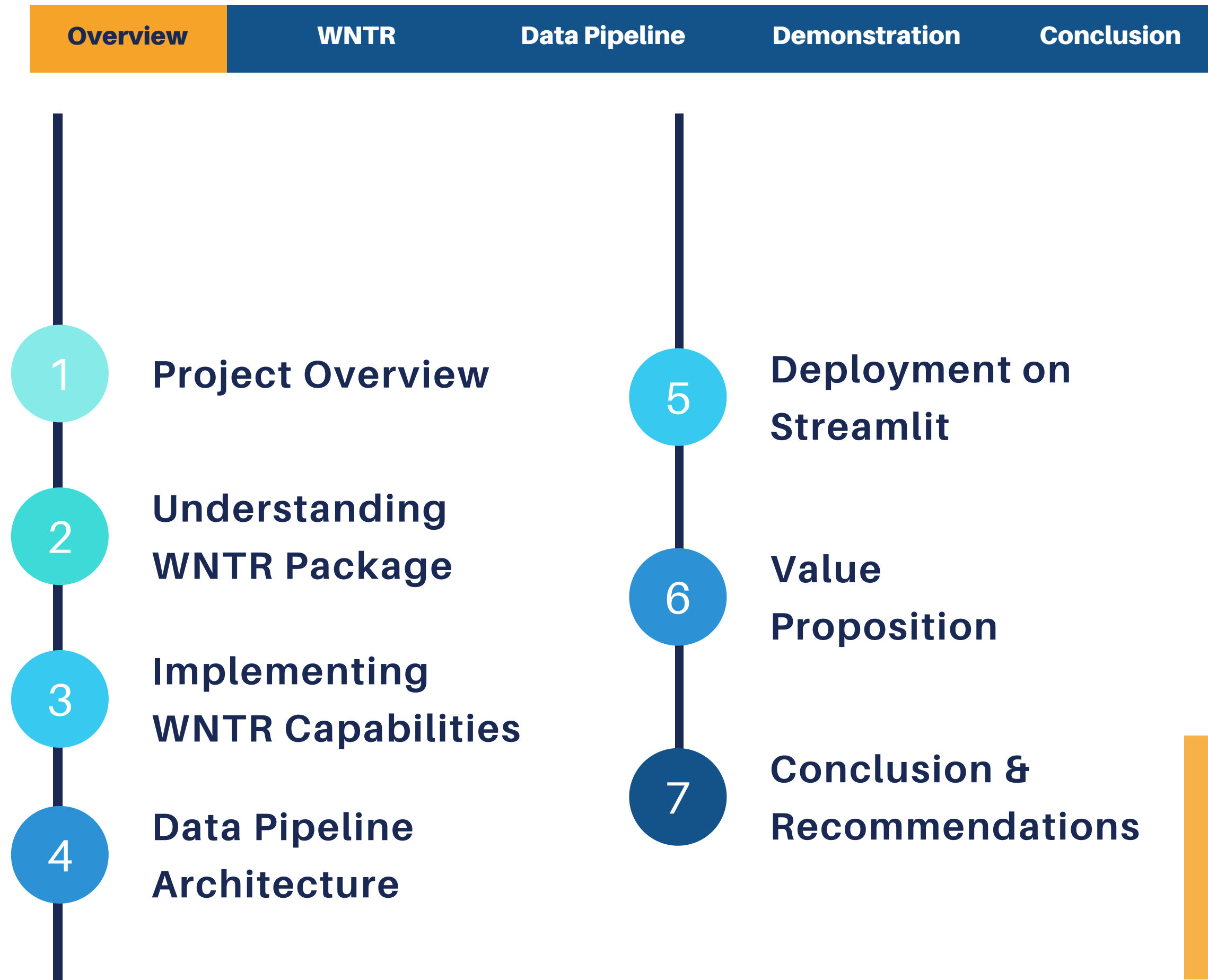


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Presentation Flow



Project Overview

- Access to clean water
- Challenges faced by water distribution systems
- A well-defined resilient water network system



Water Network System Packages

EPANET:

- Industry standard
- Demand-driven

Others packages like **MATLAB**,
Fluidit, **H2ONet** and **WNTR**



Aim

Develop EXPLORE's capability to simulate the hydraulic dynamics of water systems, testing out the suitability of an open source alternative to the industry standard EPANET model.

Objectives

- Exploring WNTR capabilities
- Simulate, analyze and stress test

Problem Statement

Is WNTR Package a viable alternative to the EPANET Software?

WNTR Package

-  Python-based package
-  Demand-driven and Pressure-dependent
-  Analyze results and generate graphics
-  With several subpackages and classes

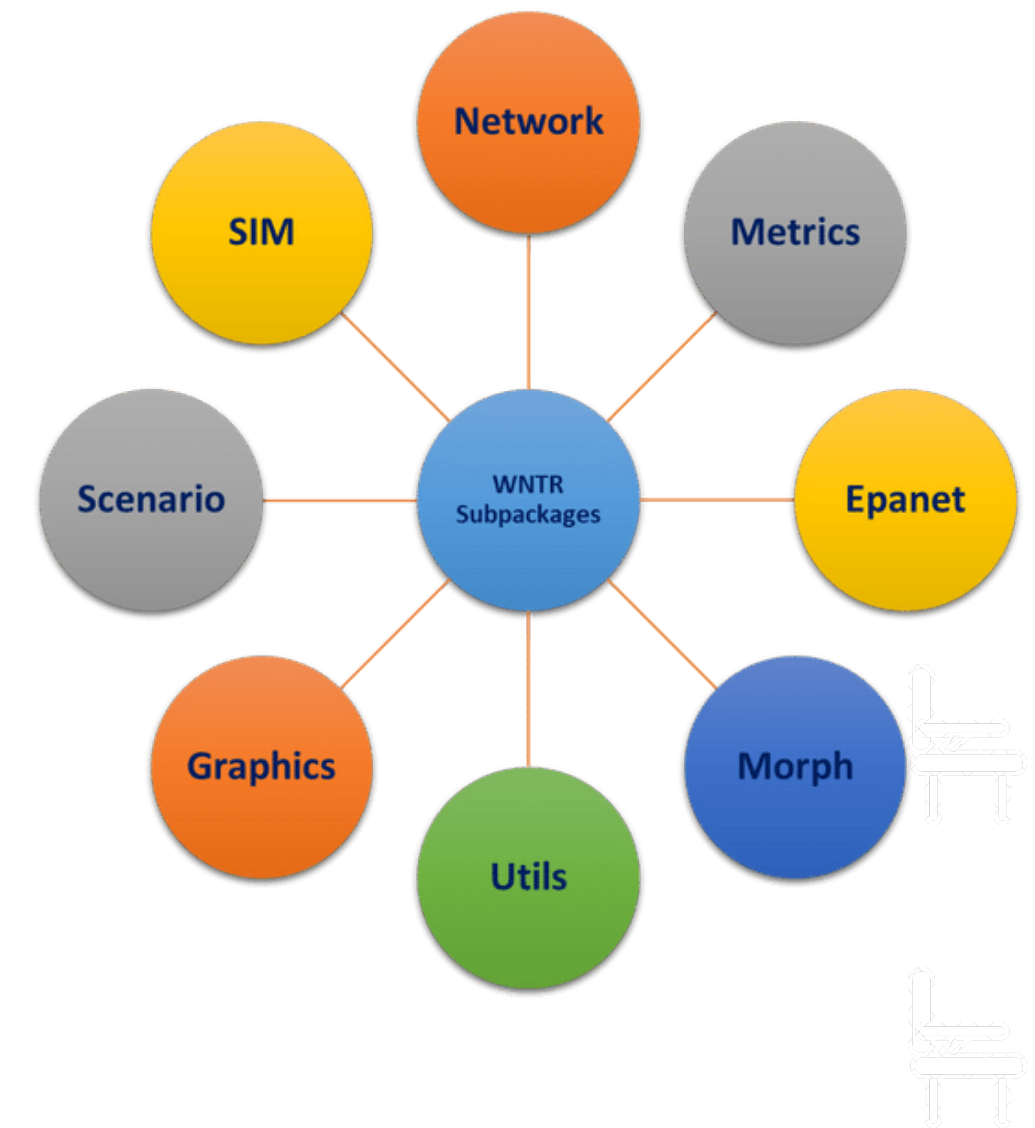


WNTR Subpackages

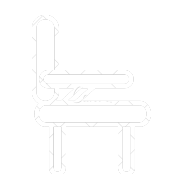
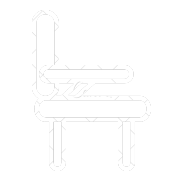
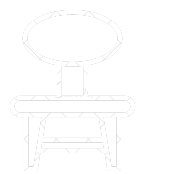
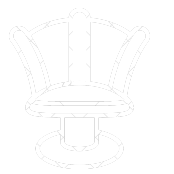
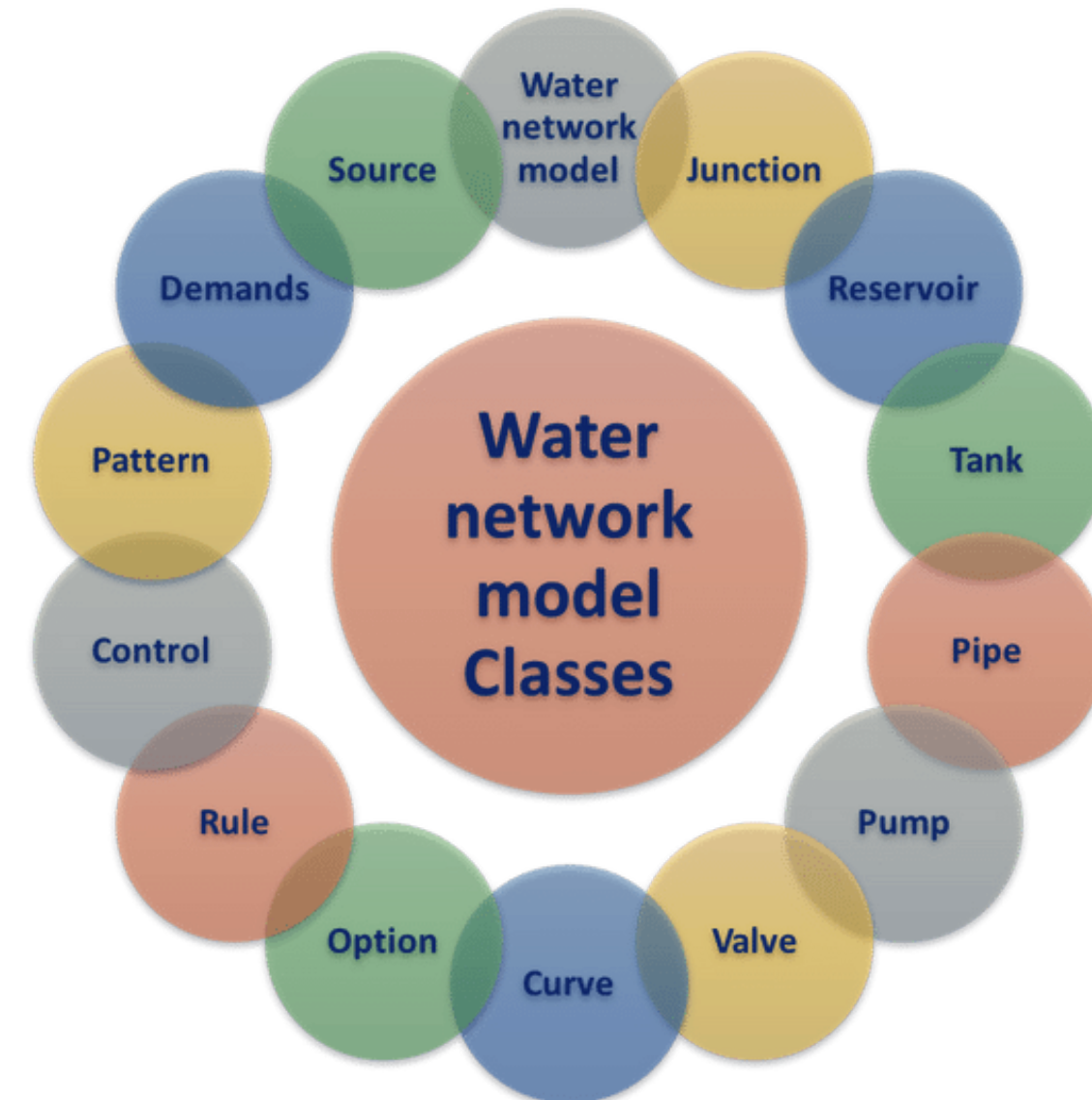
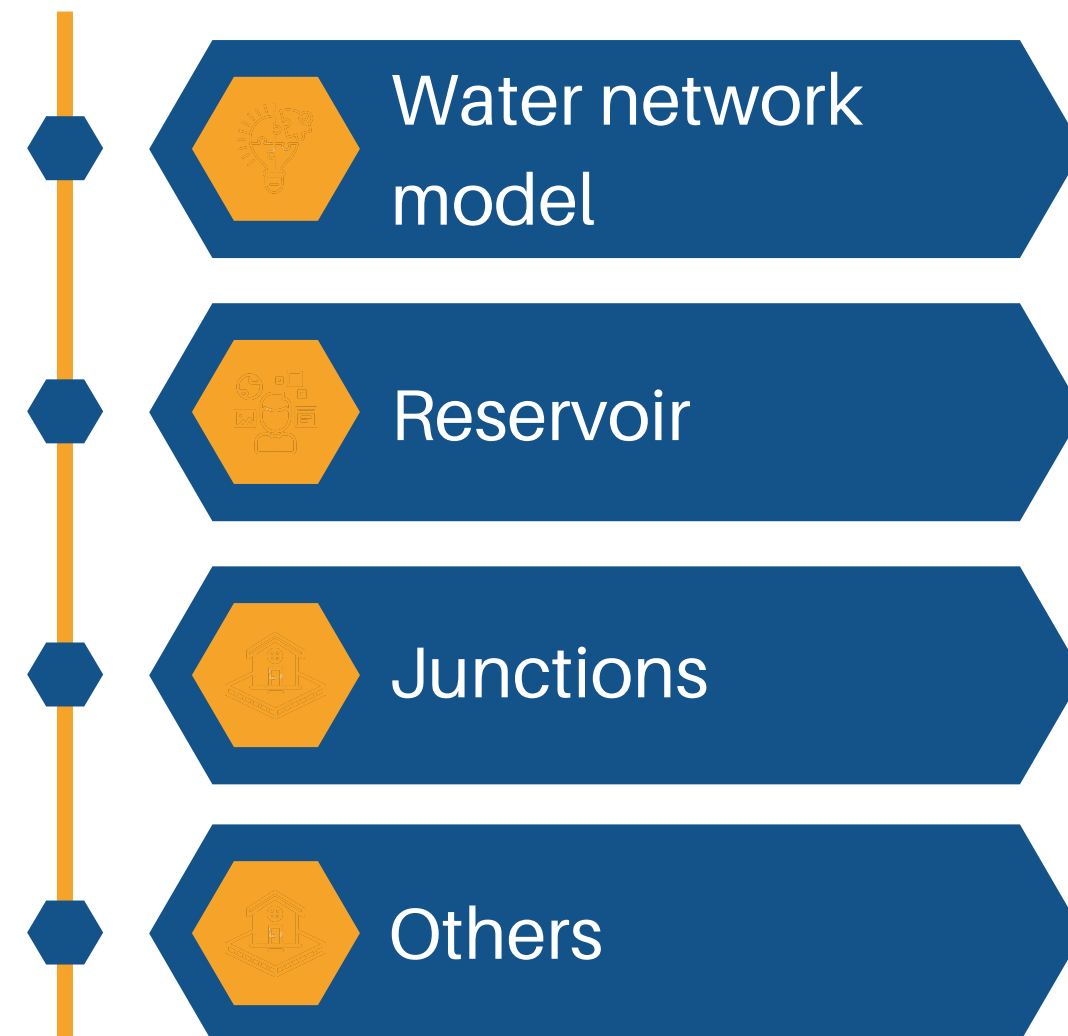
- Network
- Simulator (SIM)
- Scenario

- Metrics
- Graphics
- Epanet

- Utils
- Morph



Water Network Model Classes



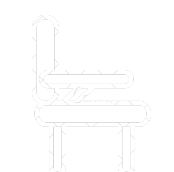
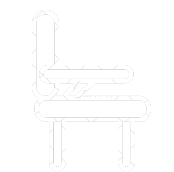
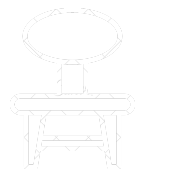
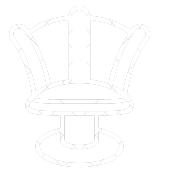
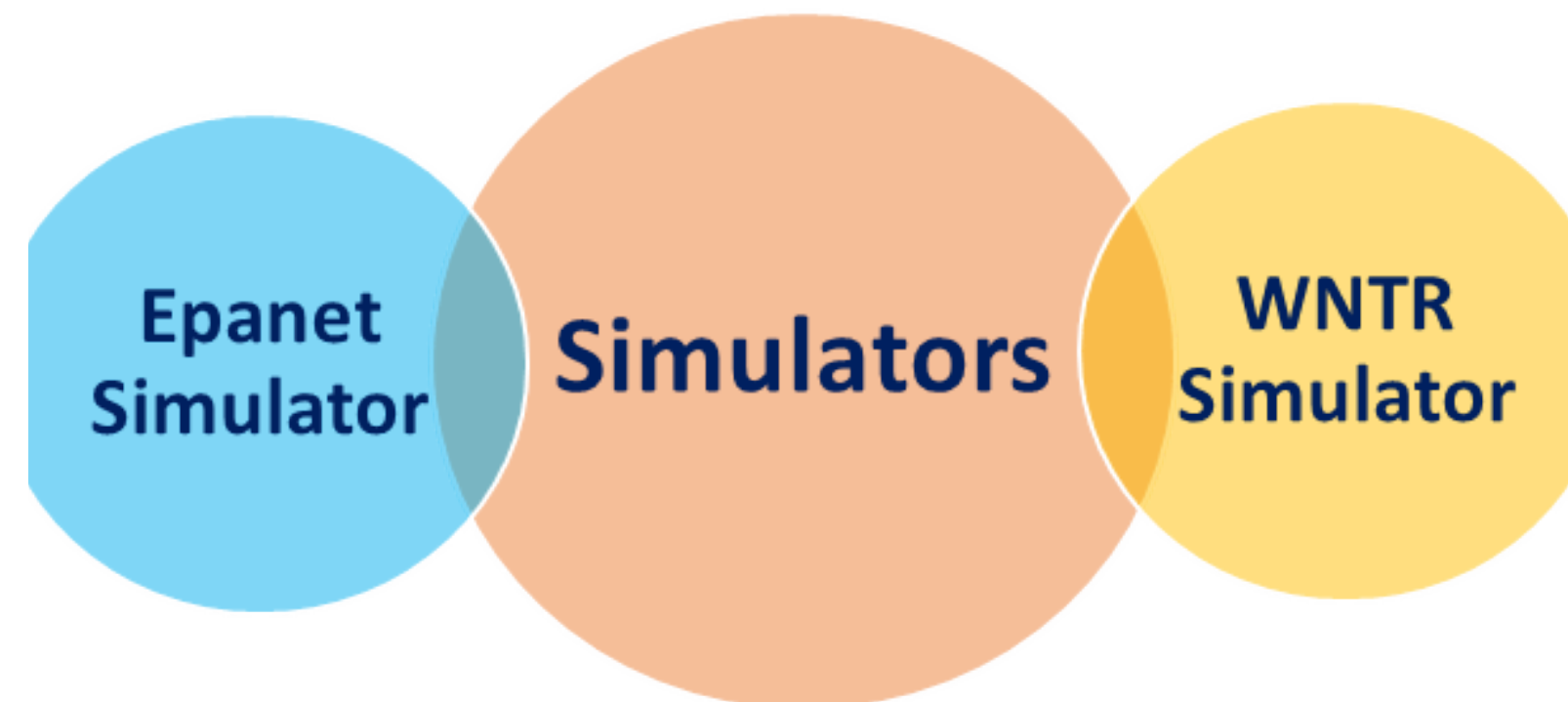
WNTR Simulators

Epanet simulator

- Suitable for simulating water quality

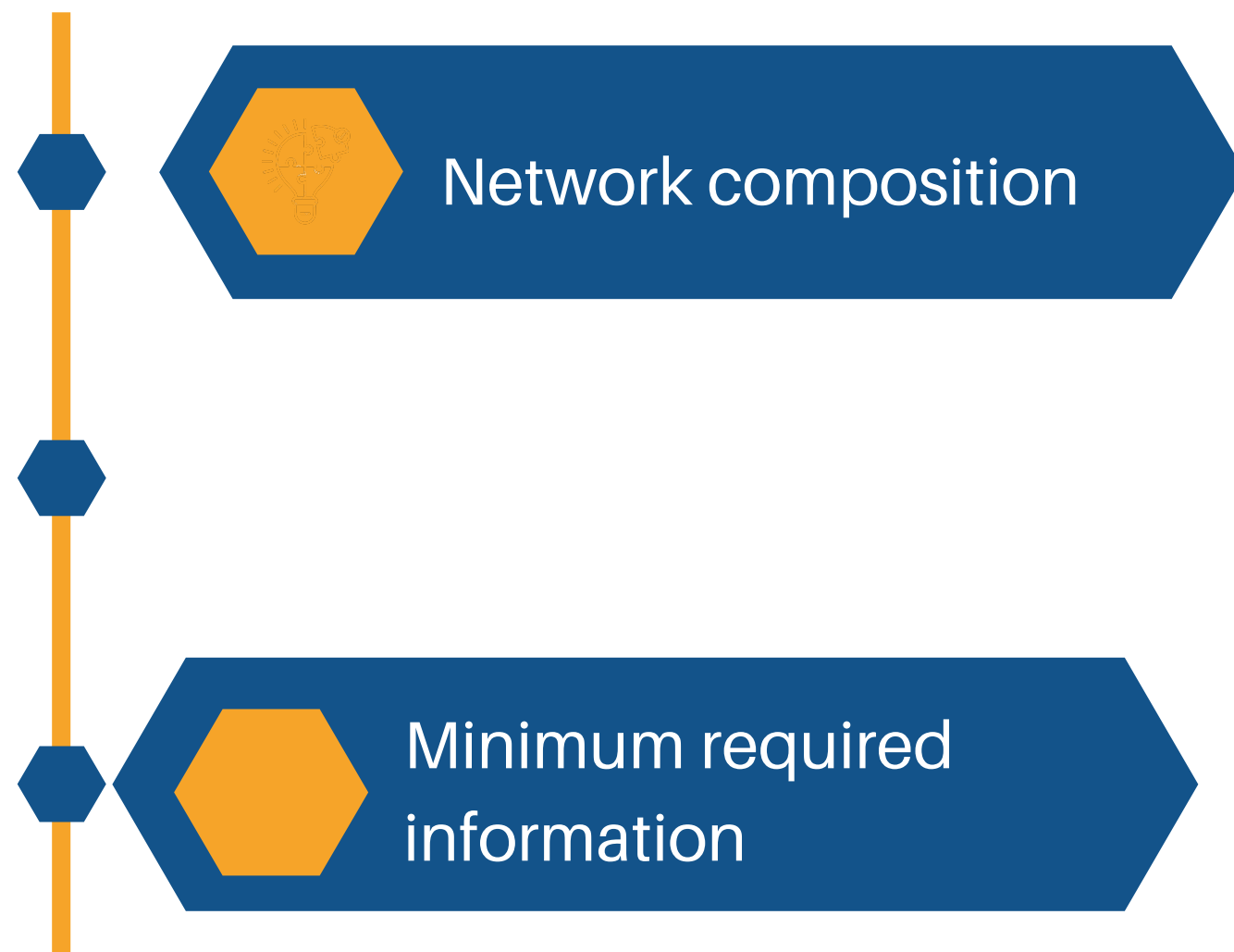
WNTR simulator

- Suitable for running both demand driven and pressure dependent analysis

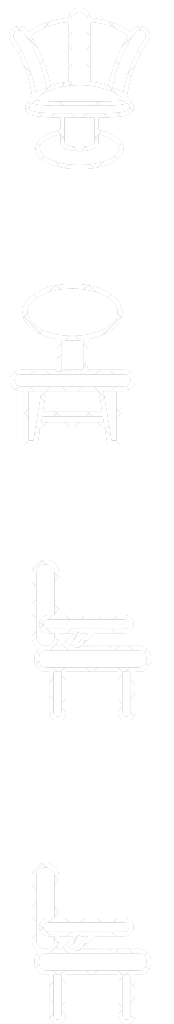
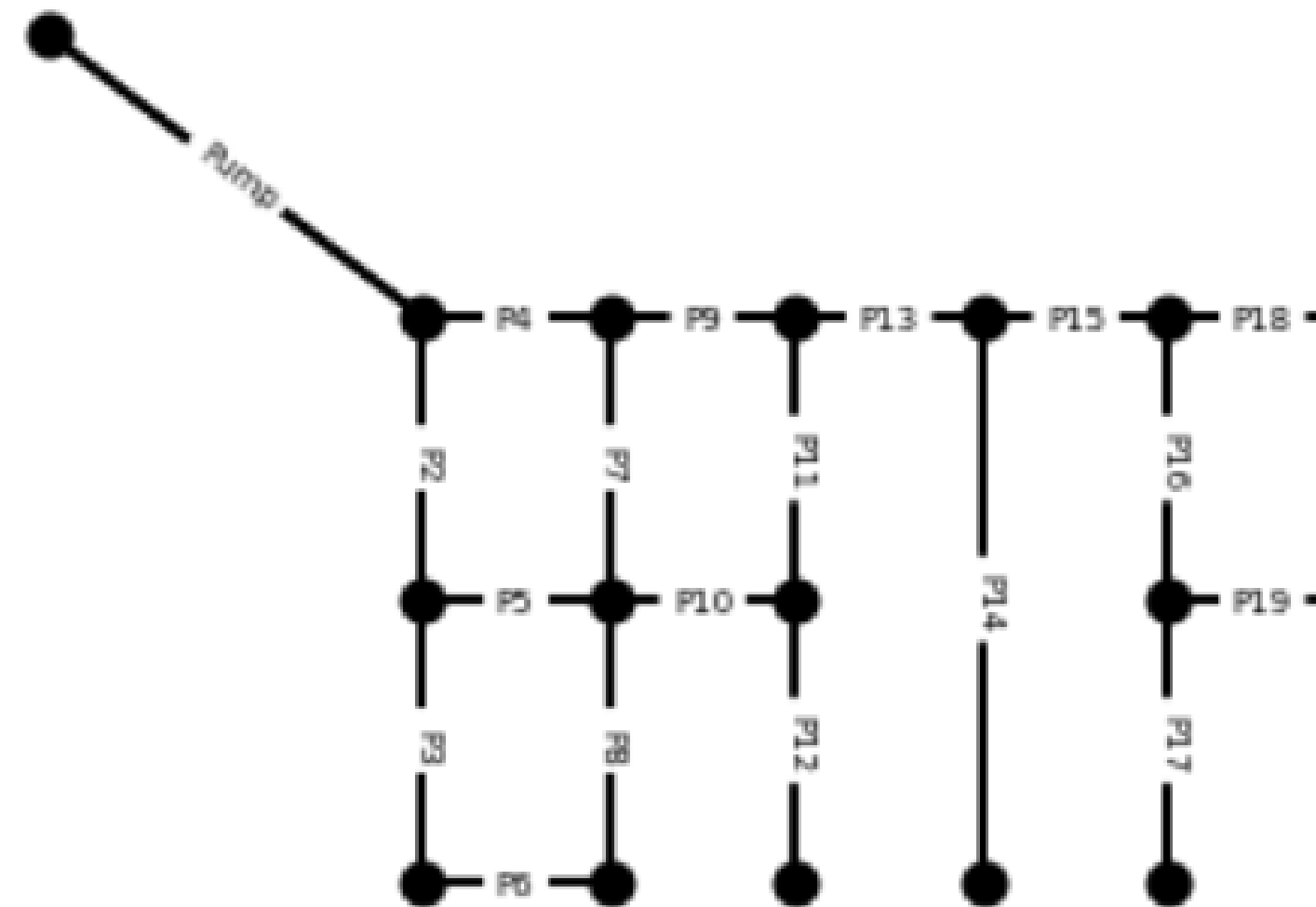


Building models from scratch

- Water network generated using the first principle

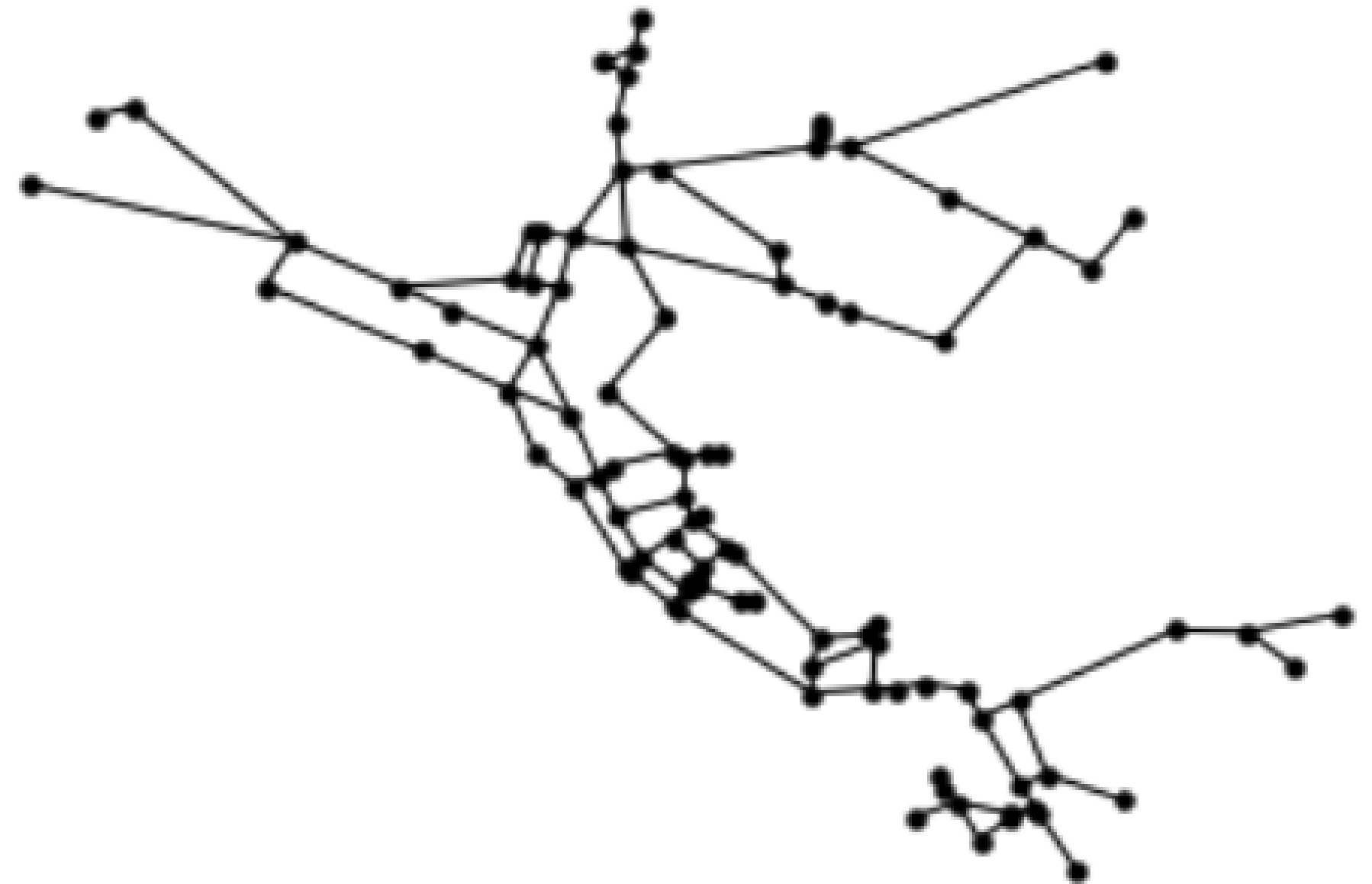
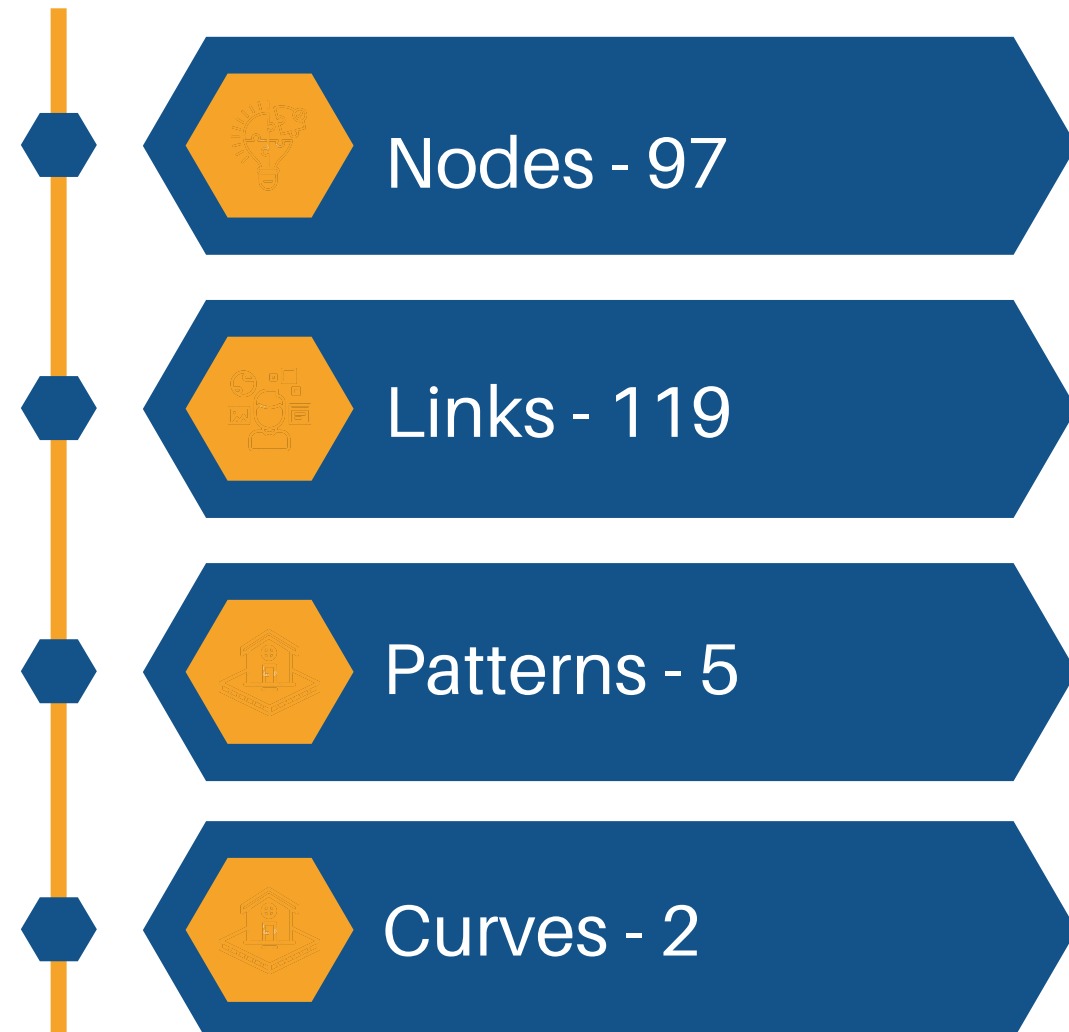


Model From scratch



Building model using available data

Water network generated using data-first approach.

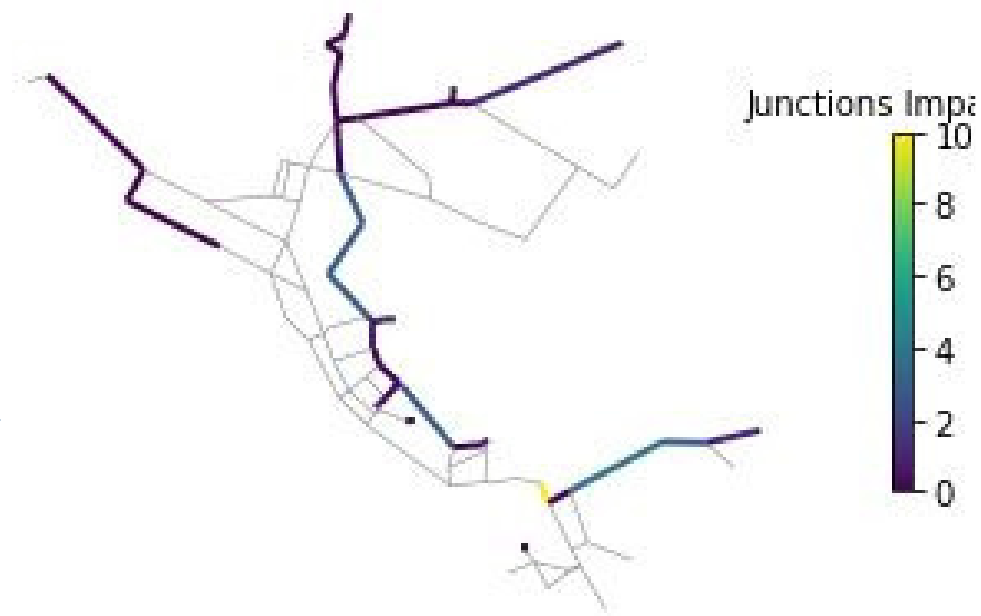


Disaster simulation: Leak

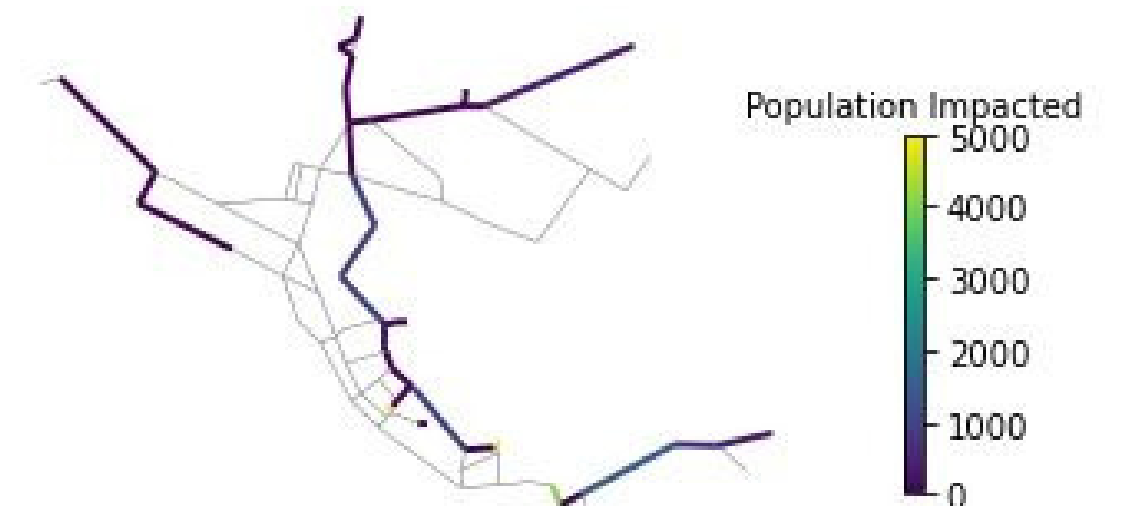
Leak parameters

People impacted

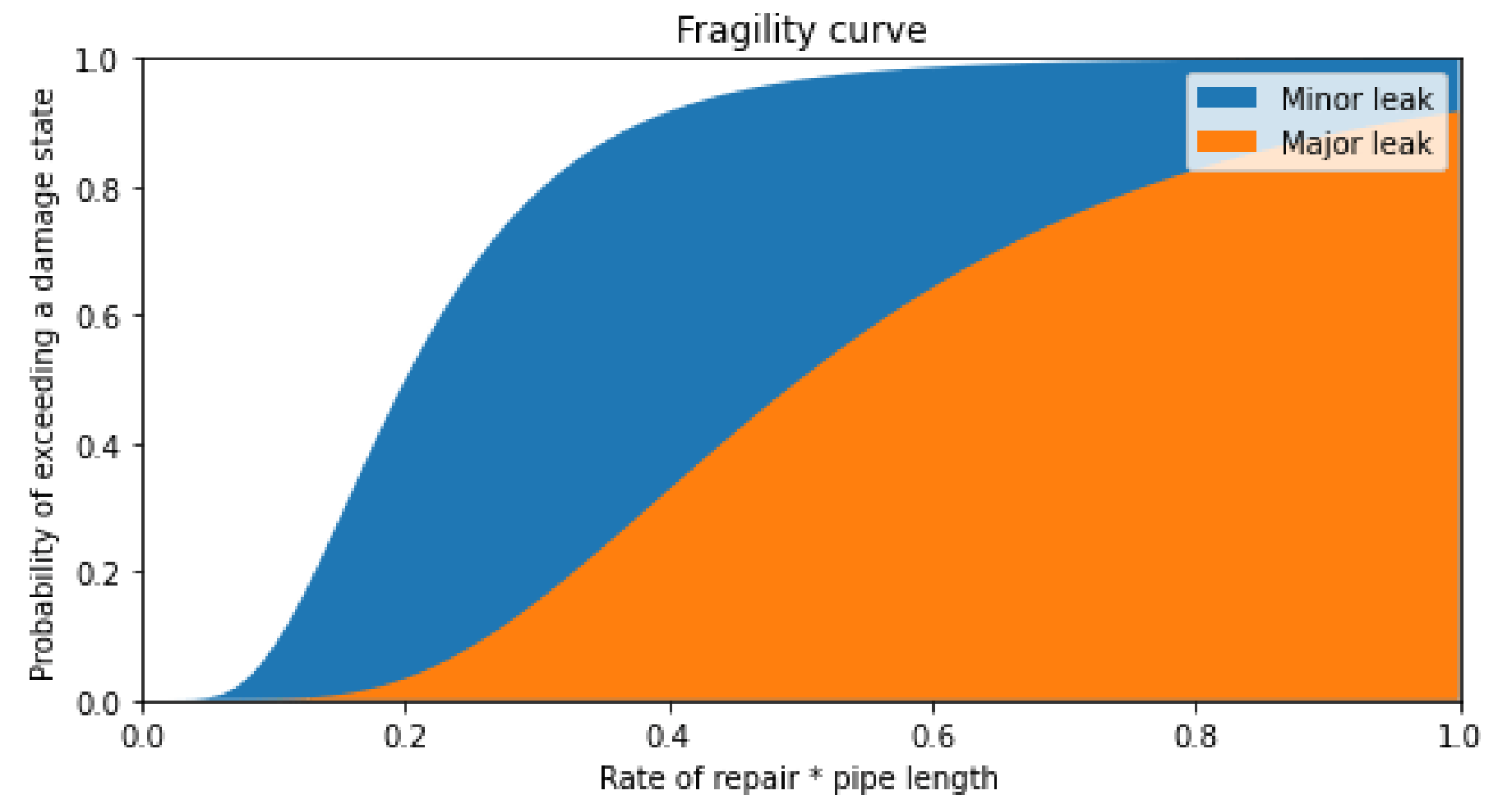
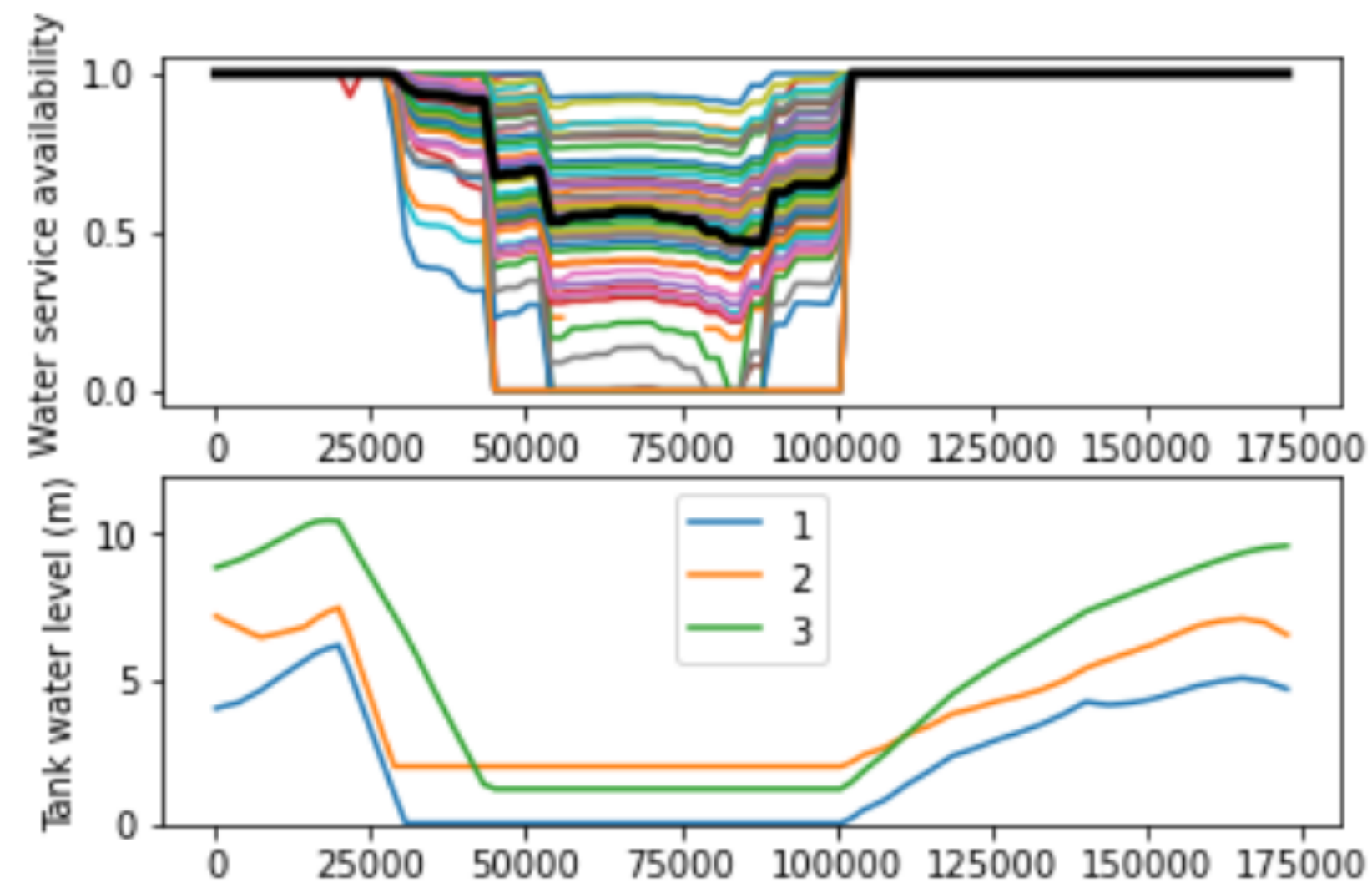
Demand



Number of people impacted by each pipe closure

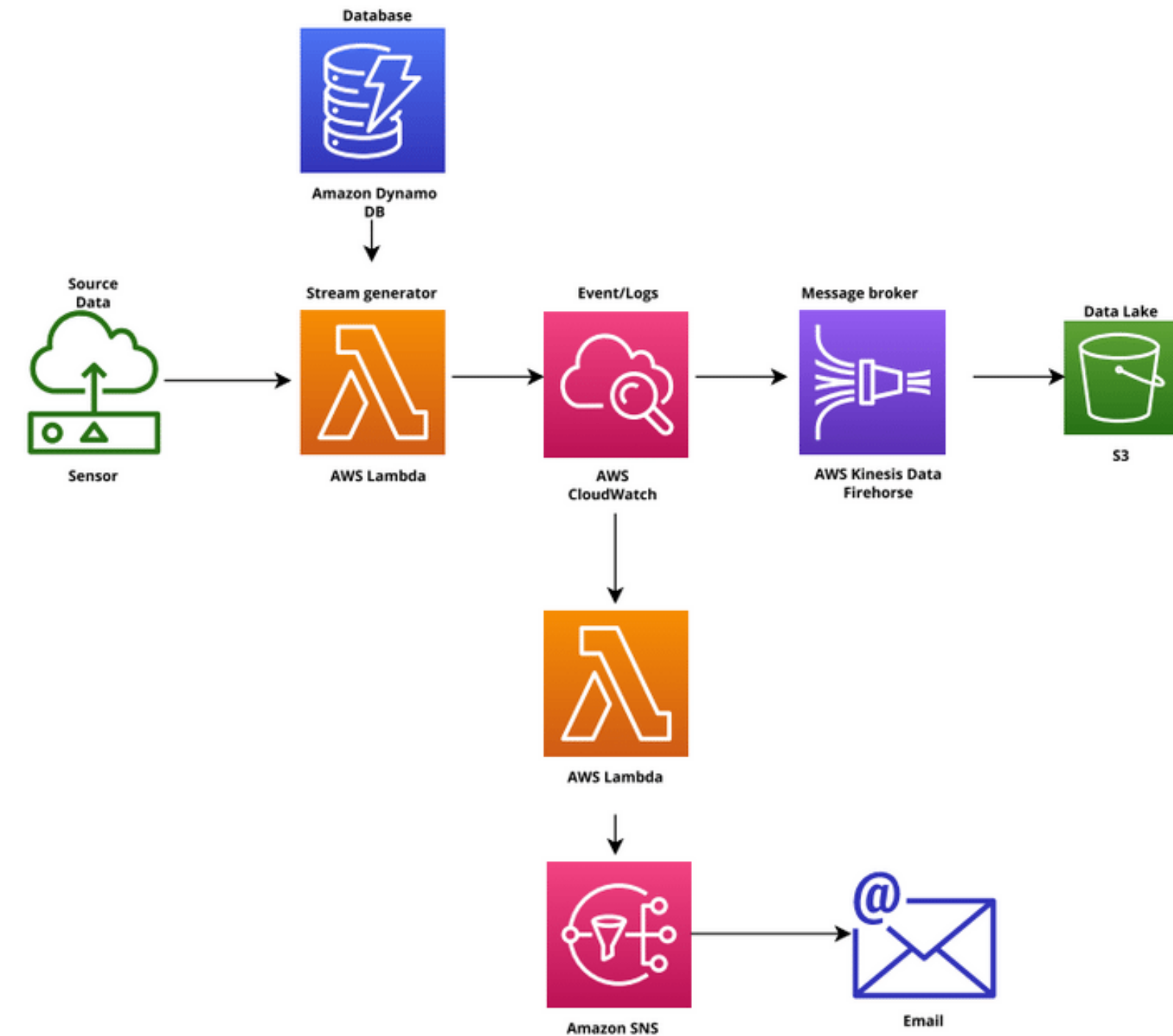
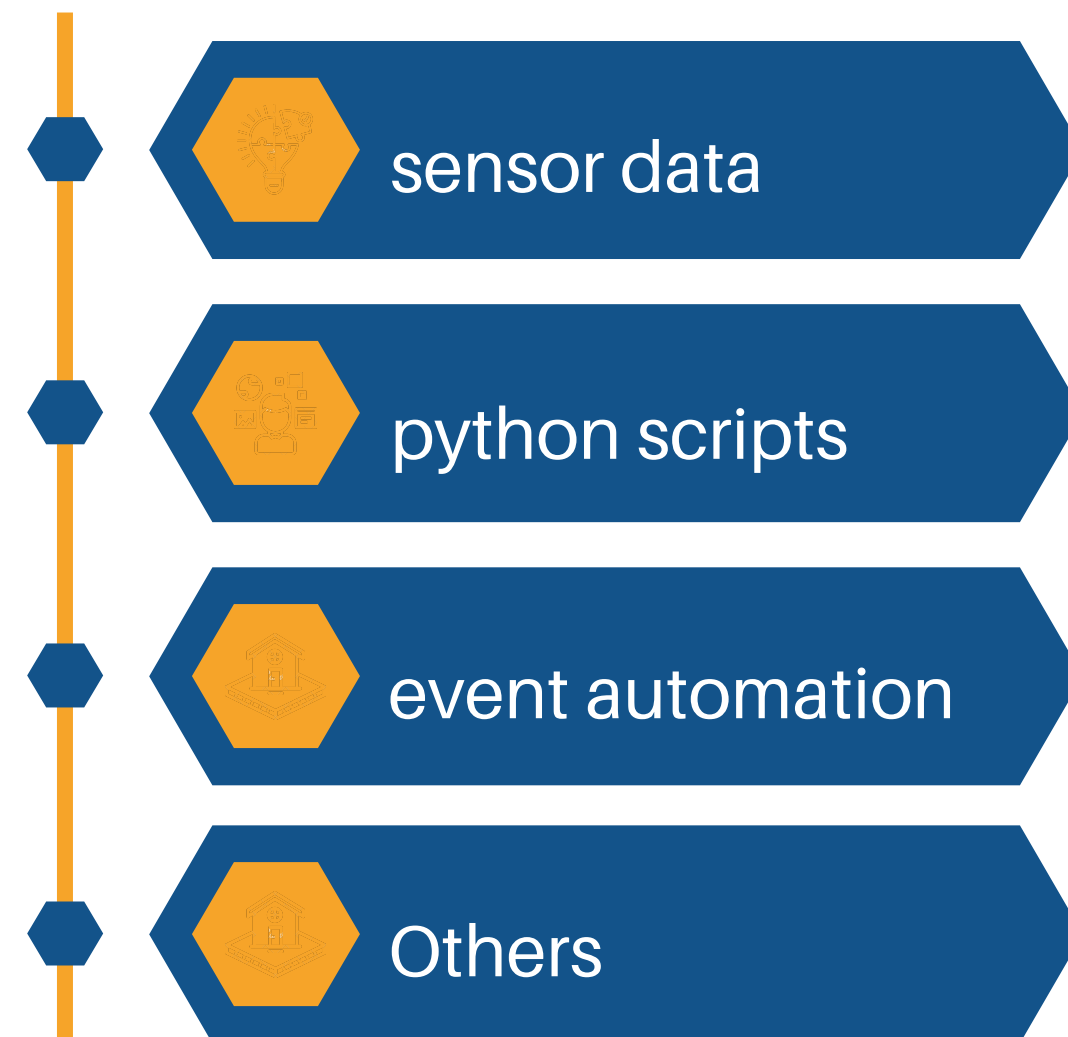


Disaster simulation: Burst

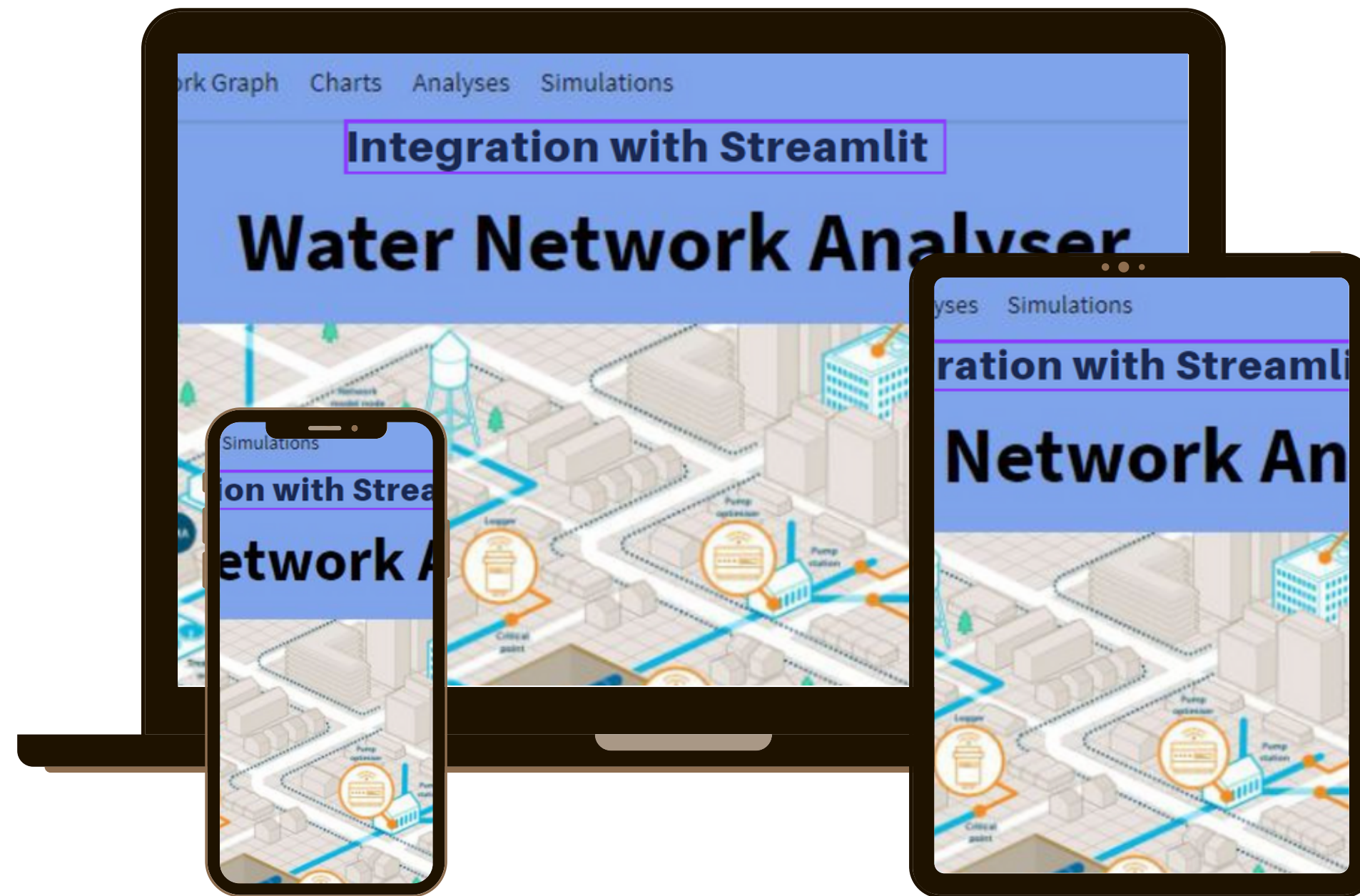


Min, Max, Average PGA: 0.13, 0.27, 0.22 g
Min, Max, Average PGV: 0.19, 0.63, 0.42 m/s
Min, Max, Average repair rate: 5e-05, 0.00015, 0.0001 per m
Min, Max, Average repair rate*pipe length: 2e-05, 0.51215, 0.05018
Number of pipe failures: 3

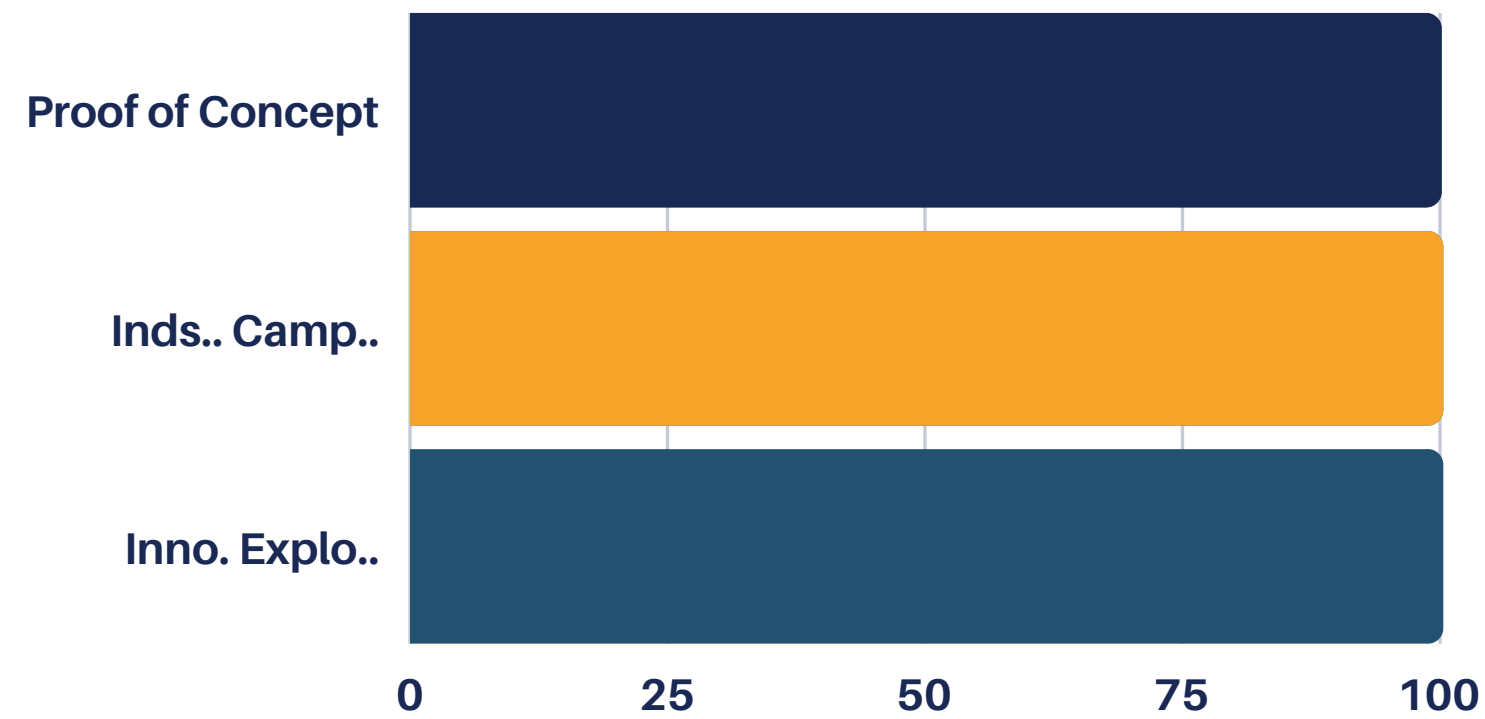
Data Pipeline Architecture



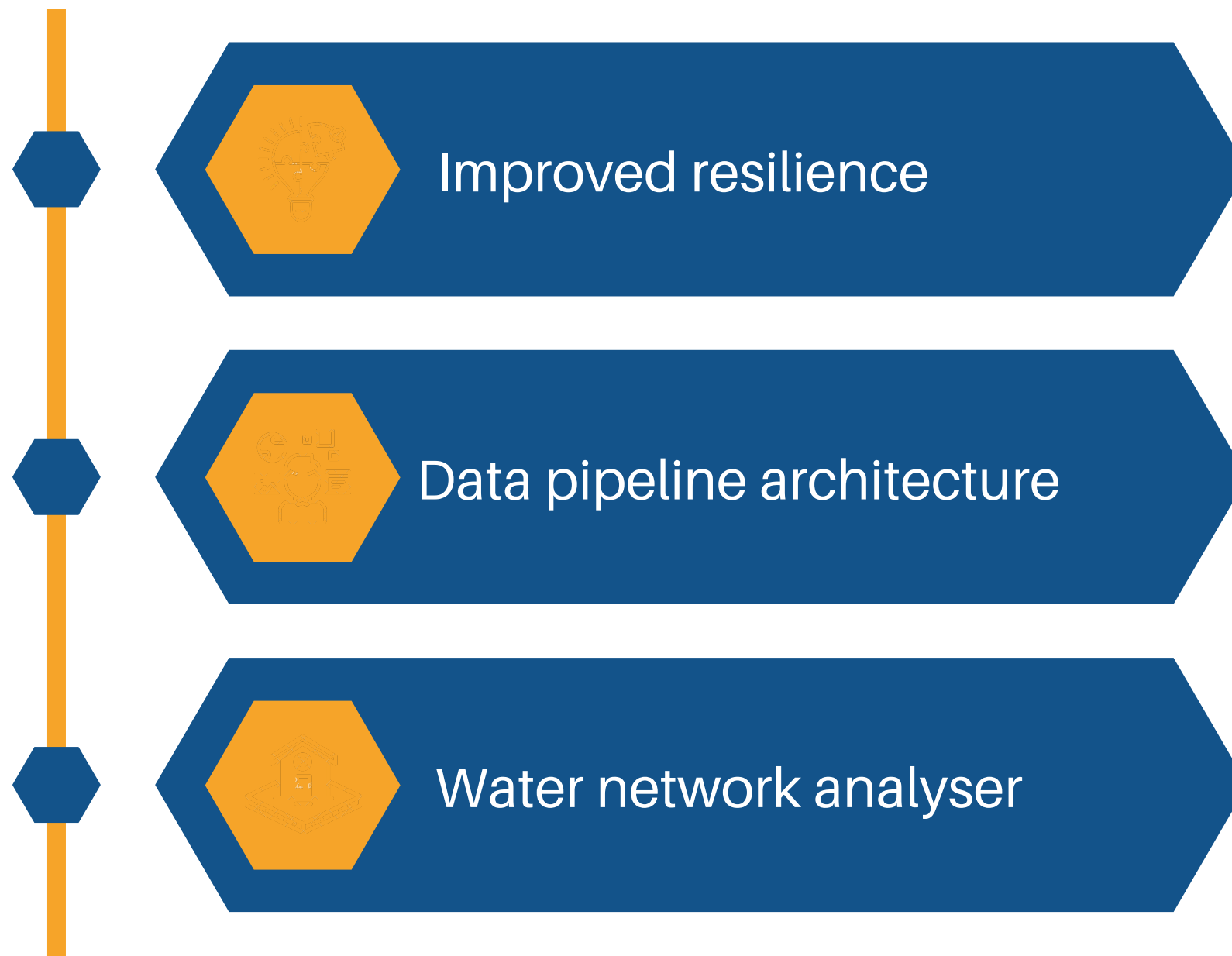
Deployment on Streamlit



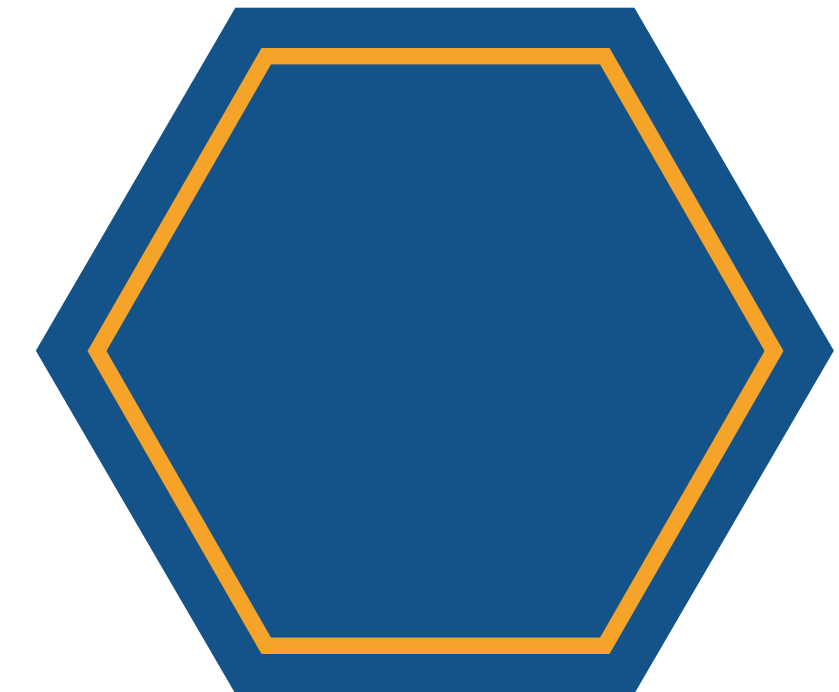
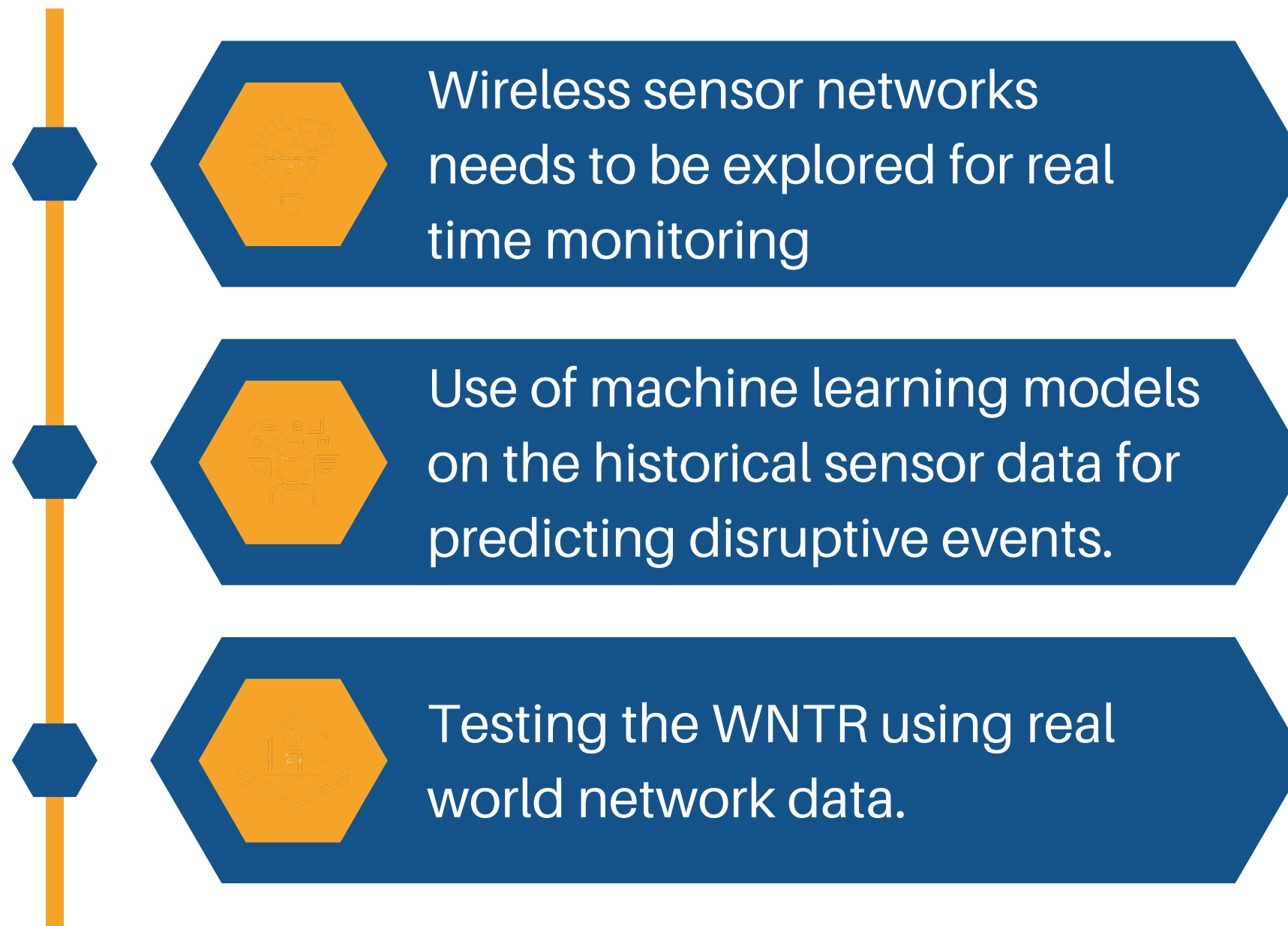
Value Proposition



Conclusion



Recommendations





**THANK
YOU**