Welcome to the WSC 2026 simulation challenge. This year, we are focusing on shipping line network and port operations. This set of materials aims to help participants gain a better understanding of the system and what is required of them.

Contents

First, we will cover the preparation material offered to participants and how they can make full use of the materials. Second, we will provide a detailed illustration of the problem and what is expected from participants. Finally, we will conclude a summary for the simulation system.

01 Preparation

- Download Tech Document
- Download Source Code Package

Let's start with the first part: preparation.

Upon successful registration, participants will be provided with a technical document and a zip package containing the source code. Please refer to the document for further details regarding the descriptions of the case description, model structure, and instructions on file downloading and submission procedures. Once the source code is downloaded and unzipped, it can be viewed and executed via Visual Studio.

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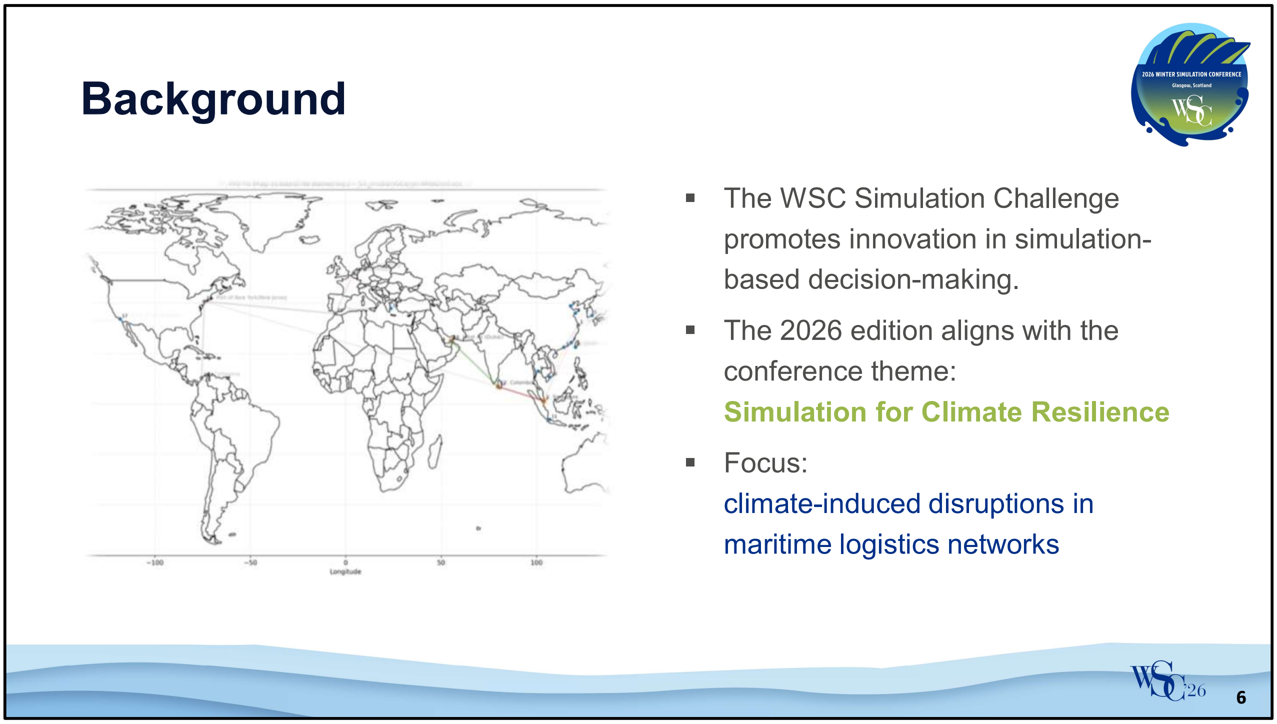
02 Problem Description

- Background
- Overview
- Diagrams
- Simulation Model
- Decision Scope
- Performance Evaluation
- Participant Tasks

Next, we have a detailed description of the problem and how the system operates.



The WSC 2026 Simulation Challenge focuses on developing simulation-based solutions to improve the resilience of maritime logistics networks against climate-induced disruptions.

Overview

We simulate a liner shipping network with:

- Circular routes serving multiple ports
- Finite vessel capacity
- Stochastic container demand
- Climate-induced sailing disruptions

Containers have origin-destination pairs.

Mitigation decisions are determined by multiple stakeholders/agents.

20 Port Destinations

Port	Shanghai	Singapore	Shenzhen	Qingdao	Busan	Tianjin	Xiamen	Kaohsiun	Laem Cha	Ho Chi Mi	Tanjung P	Colombo	Jebel Ali (	Rotterdam	Hamburg	Piraeus	Port of Lo	Port of Ne	Tanger Me	Cartagena
Shanghai	0	2075	664	294	428	499	459	531	1392	1454	2406	2768	3499	8127	8030	6958	12945	11234	8244	12313
Singapore	2075	0	1417	2264	2472	2390	1619	1602	731	596	479	1476	3162	6218	6120	5048	11036	9324	6334	10403
Shenzhen	664	1417	0	871	1079	1002	238	334	953	830	1775	2199	3230	7464	7366	6295	12282	10570	7580	11650
Qingdao	294	2264	871	0	429	213	708	809	1735	1691	2644	2825	3378	8317	8219	7148	13135	11423	8433	12503
Busan	428	2472	1079	429	0	590	856	879	2018	1903	2773	3189	3807	8537	8439	7368	13350	11644	8653	12722
Tianjin	499	2390	1002	213	590	0	873	992	1794	1794	2773	2807	3235	8407	8309	7238	13225	11513	8523	12592
Xiamen	459	1619	238	708	856	873	0	160	1190	1046	1948	2434	3403	7681	7583	6511	12498	10787	7797	11866
Kaohsiung	531	1602	334	809	879	992	160	0	1247	1056	1895	2519	3551	7683	7585	6513	12501	10789	7799	11868
Laem Chabang	1392	731	953	1735	2018	1794	1190	1247	0	369	1206	1296	2684	6668	6570	5499	11486	9774	6784	10854
Ho Chi Minh City	1454	596	830	1691	1903	1794	1046	1056	369	0	1013	1609	3052	6634	6536	5465	11452	9741	6751	10820
Tanjung Priok (J	2406	479	1775	2644	2773	2773	1948	1895	1206	1013	0	1800	3555	6658	6560	5489	11476	9764	6774	10843
Colombo	2768	1476	2199	2825	3189	2807	2434	2519	1296	1609	1800	0	1788	7327	7228	6157	12144	10433	7443	11512
Jebel Ali (Dubai)	3499	3162	3230	3378	3807	3235	3403	3551	2684	3052	3555	1788	0	9011	8914	7842	13828	12118	9127	13197
Rotterdam	14219	14150	14085	14032	14440	13851	14224	14383	13650	14017	14338	12754	10989	0	233	1173	4842	3152	1048	4532
Hamburg	14090	13931	13867	13813	14221	13632	14005	14164	13401	13796	14119	12535	10769	233	0	1093	4917	3313	1242	4743
Piraeus	13296	13326	13261	13208	13616	13026	13399	13559	12826	13193	13714	11929	10164	1173	1093	0	6008	4280	1398	5448
Port of Los Ange	16380	16311	16246	16193	16601	16012	16384	16544	15811	16178	16699	14915	13150	4842	4917	6008	0	2132	5180	2731
Port of New York	16882	16813	16748	16695	17103	16513	16886	17046	16313	16680	17201	15416	13651	3152	3313	4280	2132	0	3161	1819
Tanger Med	14792	14723	14658	14605	15013	14424	14796	14956	14223	14590	15111	13327	11562	1048	1242	1398	5180	3161	0	4071
Cartagena	18686	18618	18553	18499	18907	18318	18691	18850	18118	18485	19005	17221	15456	4532	4743	5448	2731	1819	4071	0

7 Service Routes

Service	NumStops	NumLegs	TotalSailingDistance_nm
S1_Asia-Europe-NorthEurope	16	15	34048
S2_Intra-EastAsia	8	7	3007
S3_SEA_Feeder	6	5	2654
S4_Transpacific_WestCoast	7	6	30563
S5_Asia-USEast	8	7	32957
S6_Transatlantic_SouthConnector	9	8	12522
S7_IndianOcean-MiddleEast	5	4	6528

6 Vessel Types

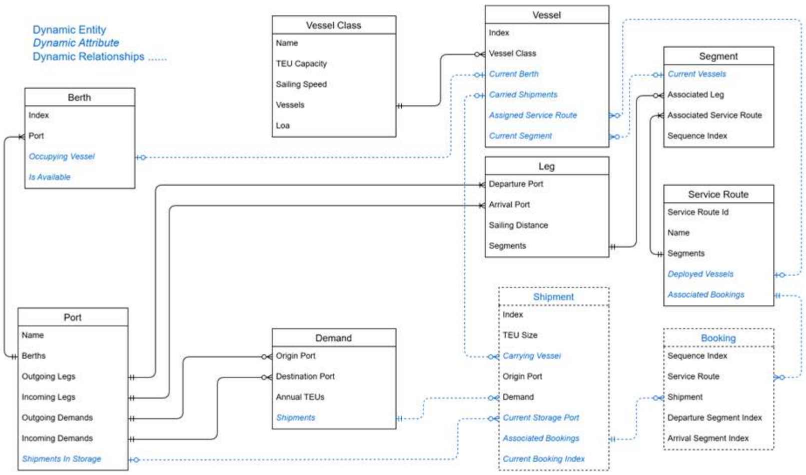
VesselClass	Capacity_TEU
Feeder	1800
Feedermax	2800
Panamax	5000
Post-Panamax	8000
Neo-Panamax	13000
ULCV	18000

This simulation models a global liner shipping network in which vessels transport containers between ports under realistic operational constraints.

Key characteristics of the modeled system:

- 20 destination ports connected by a shipping network.
- 7 circular service routes that visit multiple ports.
- 6 vessel types with different carrying capacities.
- Finite vessel capacity, limiting the number of containers that can be transported.
- Each container has a predefined origin and destination, while disruption mitigation strategies are determined by multiple stakeholders or agents within the shipping network.

Diagrams: Entity Relationship Diagram (ERD)



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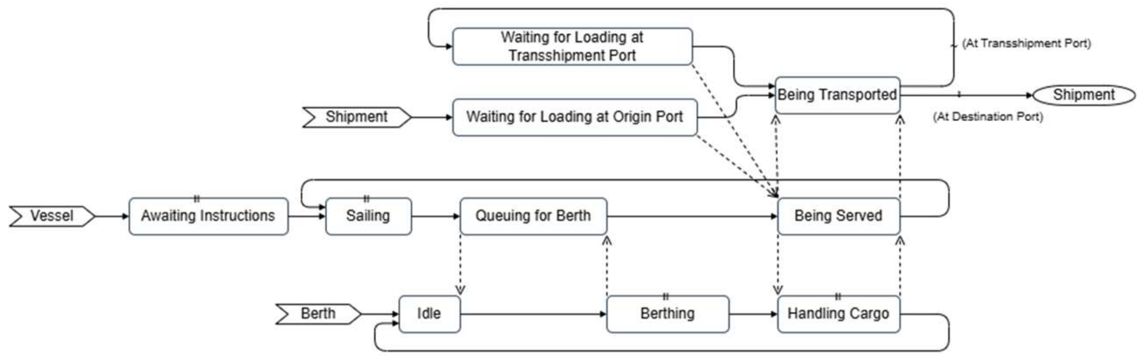
Here is the Entity Relationship Diagram. There are 10 entities, each with some attributes. Attributes in black represent static attributes, which are constant. Other attributes in blue represent dynamic attributes that change over time. For the details about the entity attributes and their definitions, please refer to the provided Tech Document.

Diagrams: Event Flow Diagram (EFD)



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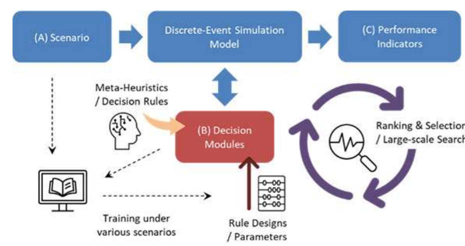
For the event flow diagram, each entity goes through a series of activities. In the Tech Document, we describe the process of entities passing through activities and their interactions with each other.

Simulation Model: Baseline Scenario

- We will provide a baseline discrete-event simulation model (implemented in Python) with clear documentation describing the model structure under a rigorously defined modelling formalism.
- The provided package will specify three elements:
  - (A) Variable scenario parameters (e.g., real-time demand, resource availability, disruptions)
  - (B) Key operational decisions & default rules (e.g., routing/path planning, task assignment, sequencing)
  - (C) Performance indicators (KPIs) used for evaluation



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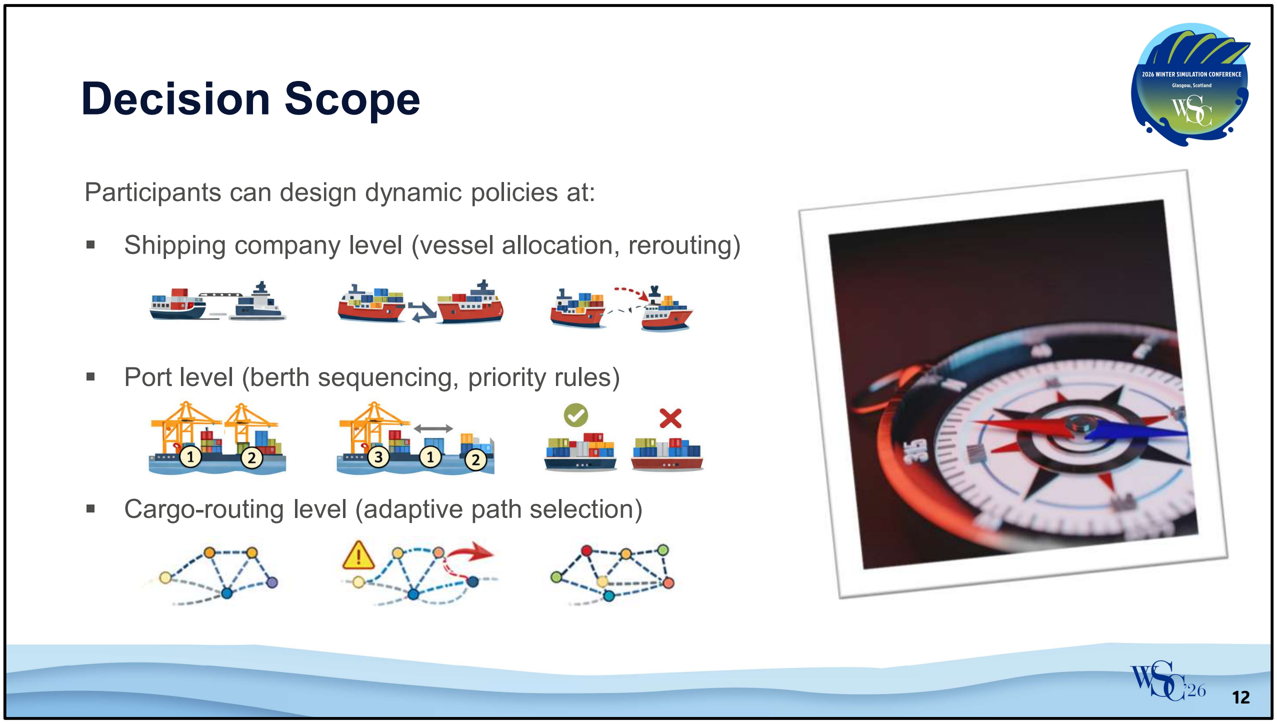
Our simulation model includes a baseline scenario and a disruption scenario. In the baseline scenario, the simulation runs under normal operating conditions. It includes three main parts: scenario parameters, operational decision rules, and performance indicators used to evaluate your strategy. In the code, the baseline scenario is built from CSV input files in the Input folder. The simulation then creates a Model, runs a warm-up period, measures daily operations, and writes KPI outputs to CSV files in the Output folder.

Simulation Model: Climate Disruption Scenario

- Disruptions occur between port pairs
- Sailing time increases significantly
- Duration is stochastic
- Congestion propagates across the network

This models extreme climate volatility and systemic vulnerability.

A climate disruption scenario, where adverse weather delays vessel movements and causes network-wide congestion. In the provided model, this scenario is implemented in disruption_scenario.py.



When disruptions occur, participants can design dynamic decision policies at three levels. At the shipping company level, decisions include vessel allocation and ship rerouting. At the port level, participants can optimize berth sequencing and priority rules for waiting vessels. At the cargo-routing level, participants can adapt cargo routes to ensure shipments continue moving efficiently despite changing conditions.

Performance Evaluation

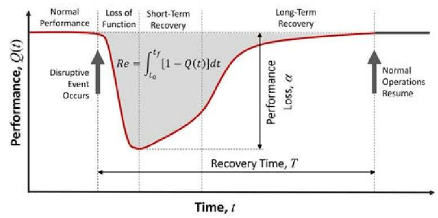
System resilience will be evaluated using a resilience curve.

Define:

$$Q(t) = \frac{\text{Average Transport Time under Normal Conditions}}{\text{Actual Average Transport Time at Time } t}$$

Resilience loss over time is measured as:

$$\int (1 - Q(t))dt$$



Participants aim to:

- Minimize performance degradation
- Accelerate recovery
- Reduce total resilience loss

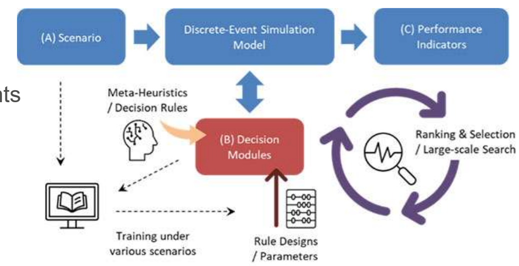
This captures not only efficiency, but also the **dynamic recovery capability under climate disruption**.

The performance is evaluated using a resilience curve that compares normal transport time with actual transport time during disruptions. Your goal is to reduce performance loss, recover faster, and lower the total resilience loss over time.

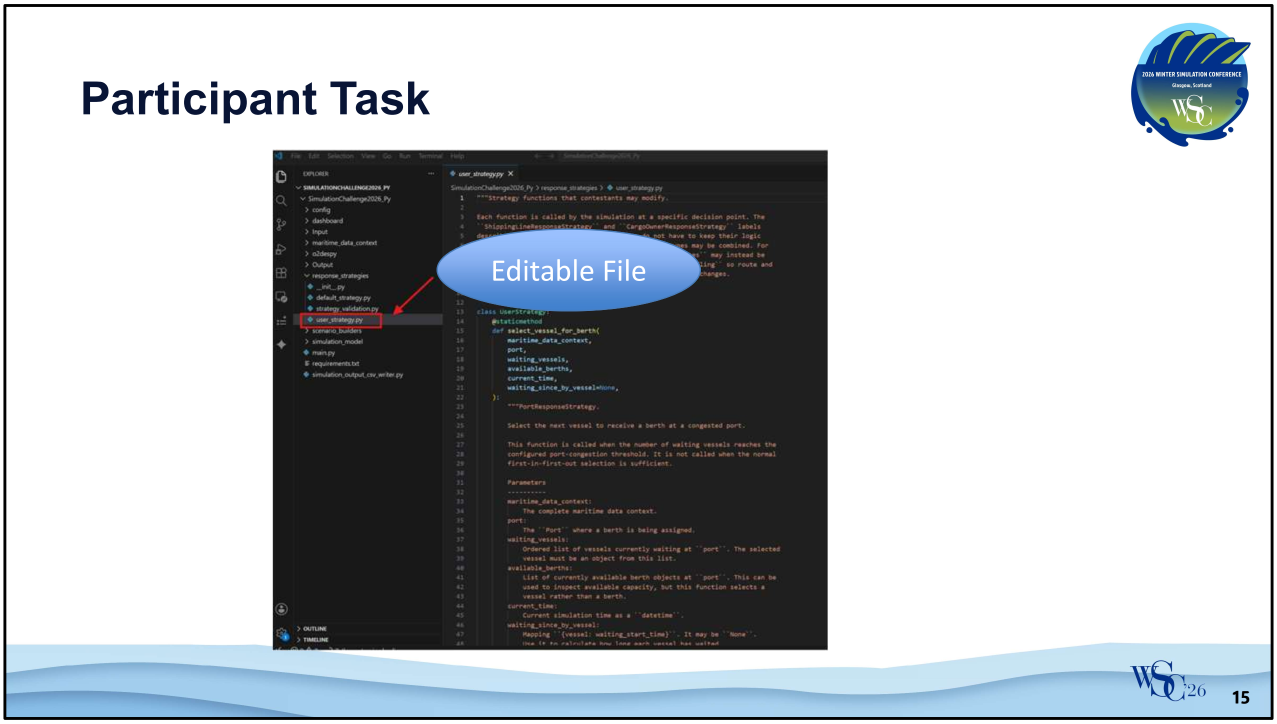
Participant Task

- Submit only the Decision Modules (B): rewrite/replace the designated decision-event algorithms to maximize performance (C) across scenarios (A).
- Approaches may include (non-exhaustive):

  - Rule-based scripts / heuristics embedded in decision events
  - Simulation embedded in external optimization / search
  - Learning-based methods to tune or infer decision-rule parameters, then embed into decision events



Participants need to improve the simulation by changing only the decision modules. You can use rules, optimization, or learning methods to make better decisions



In the provided package, “User_strategy.py” is the decision module that can be edited by participants. Here, you are invited to implement your own strategy for the port, cargo owner, and shipping line.

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03 Summary

- Structure of Simulation System

Finally, we will show a simple summary for the simulation system.

Structure of Simulation System

```
SIMULATIONCHALLENGE2026_PY
  > config
  > dashboard
  > Input
  > maritime_data_context
  > o2despy
  > Output
  > response_strategies
  > scenario_builders
  > simulation_model
  main.py
  requirements.txt
  simulation_output_csv_writer.py
```

Folder Name	Summary
config	Simulation configuration settings
dashboard	Browser-based dashboard files for viewing simulation outputs
Input	Input datasets for the baseline scenario
maritime_data_context	Data model classes for maritime entities
o2despy	Local bundled simulation framework package used by the project.
Output	Generated simulation output CSV files
response_strategies	Strategy files for handling disruptions or operational decisions
scenario_builders	Code that builds simulation scenarios
simulation_model	Main maritime simulation logic
main.py	Runs the simulation
requirements.txt	Lists dependencies
simulation_output_csv_writer.py	Writes simulation results to CSV files

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Here is a simple summary of what the main folder contains in the simulation system.