ALGORITHM DESIGN - LEIC

PROJECT 1

G11_3

Water Supply Management System

Work

Analysis tool that can support the management of a water supply network in Portugal to make informed decisions about how to best allocate its resources

Group Members

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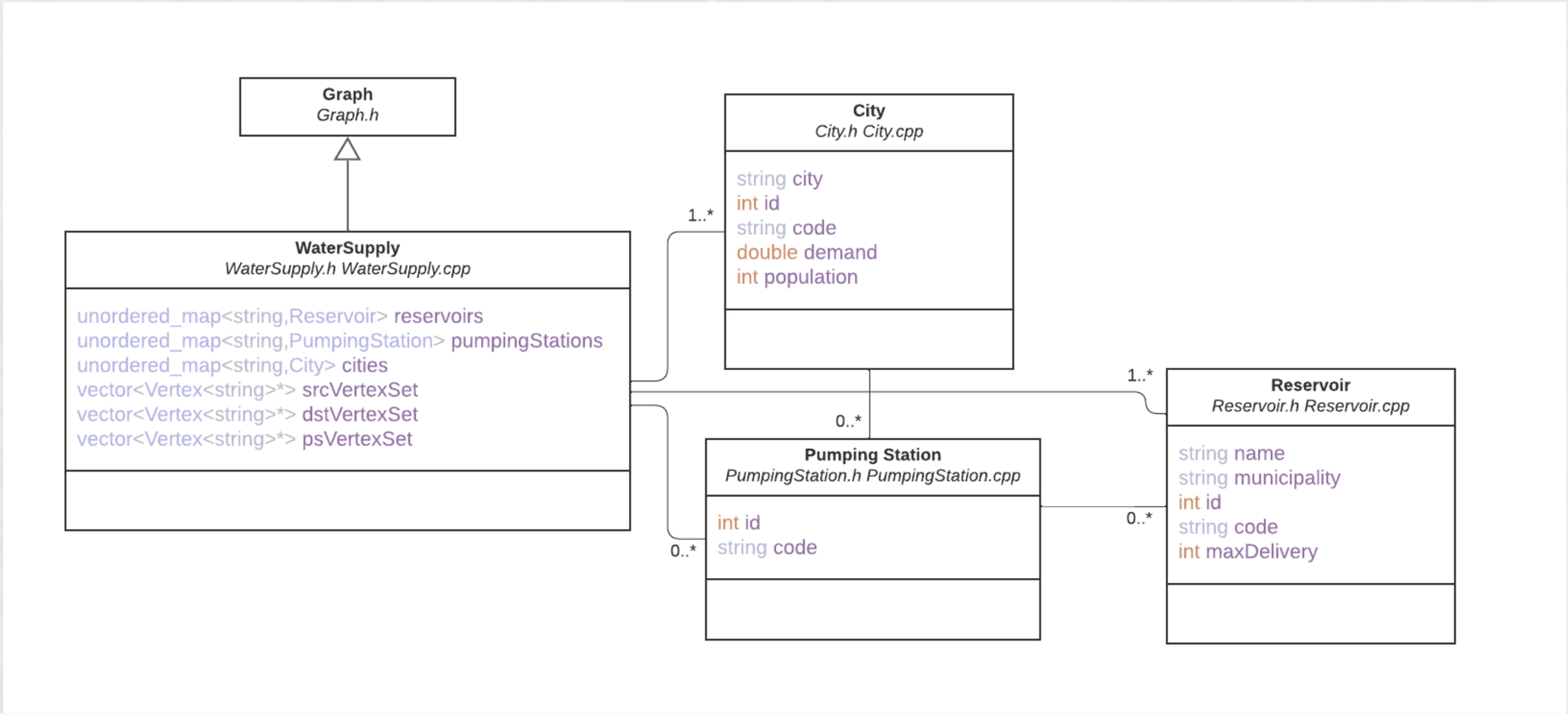
Class Diagram

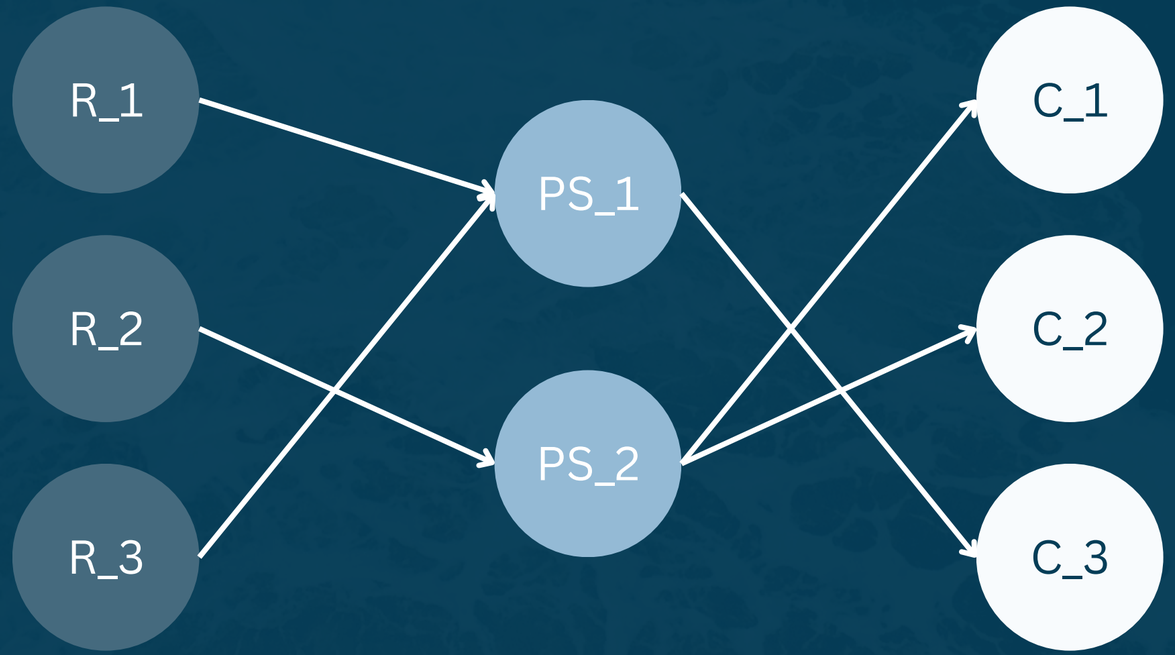


Reading Dataset

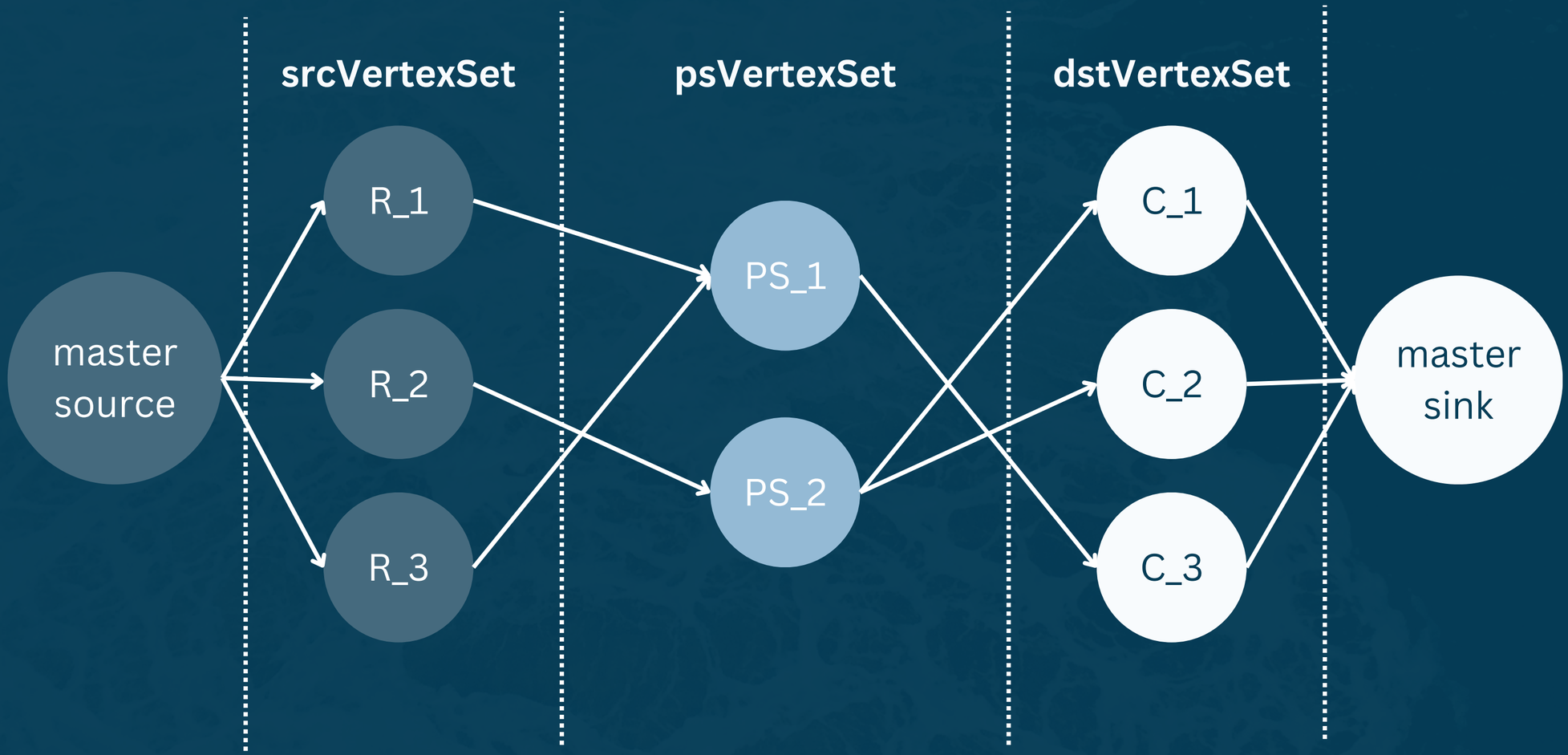
FileReader.cpp

Utilizes **ifstream** to read data from CSV files, constructing instances of Reservoir, PumpingStation, City classes and pipe connections, and then adds them to the WaterSupply network accordingly.

GRAPH



GRAPH


srcVertexSet
psVertexSet
dstVertexSet
master source
R_1
R_2
R_3
PS_1
PS_2
C_1
C_2
C_3
master sink

FUNCTIONALITIES I

MAX FLOW CITY

Calculates maximum flow for the specified city using Edmonds-Karp algorithm

O(S*(V*E^2))

S = #Sources (Reservoirs)

MAX FLOW GRAPH

Calculates the maximum flow for the entire graph using Edmonds-Karp algorithm. Optionally, it can run in an inverse order for special cases

O(V*E^2)

MAX FLOW GRAPH BALANCED

Balances the maximum flow in the graph by running the algorithm in both normal and inverse orders

O(V*E^2)

FUNCTIONALITIES II

REMOVE RESERVOIR AND LIST AFFECTED CITIES

Removes a reservoir from the graph and lists affected cities by recalculating maximum flow

O(V*E^2)

CHECK USELESS PUMPING STATIONS

Checks and lists the impact of removing each pumping station from the graph

O(P*(V*E^2))

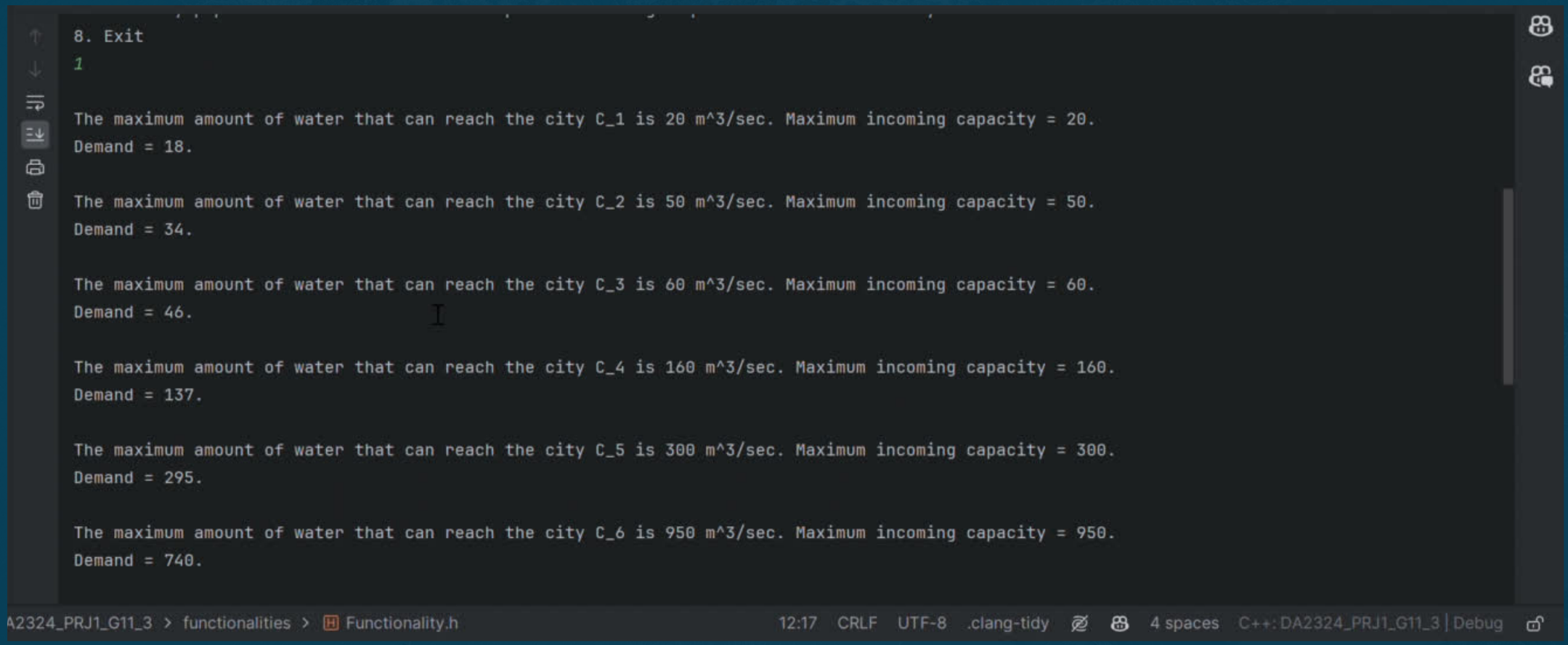
P = #Pumping Stations

CHECK CRITICAL PIPES

Checks and lists the impact of removing each pipe from the graph

O(V*E^3)

USER INTERFACE



Highlights

MAX FLOW GRAPH

Main difficulties

Balance Network Algorithm

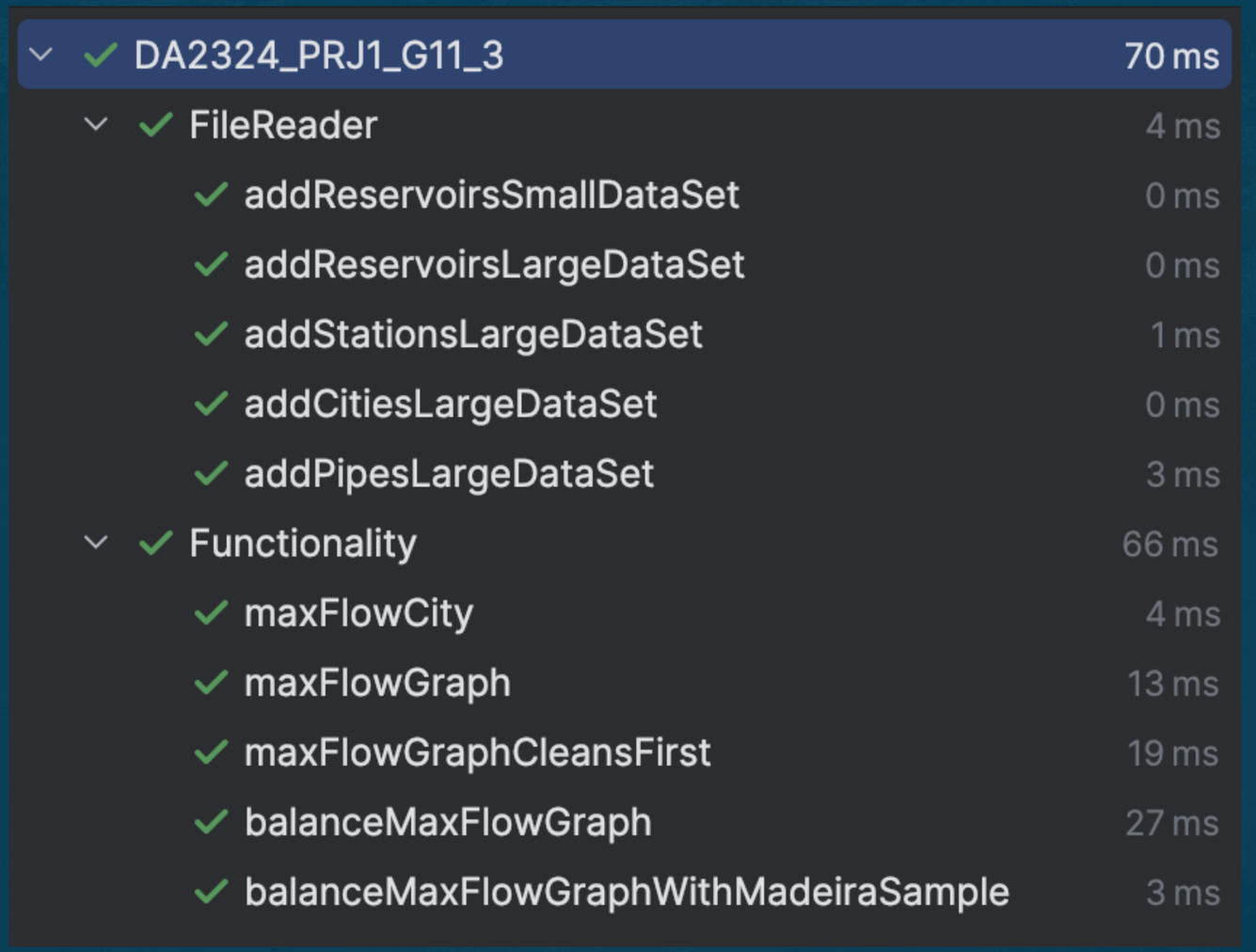
Class Design/Structure

Copying a graph object

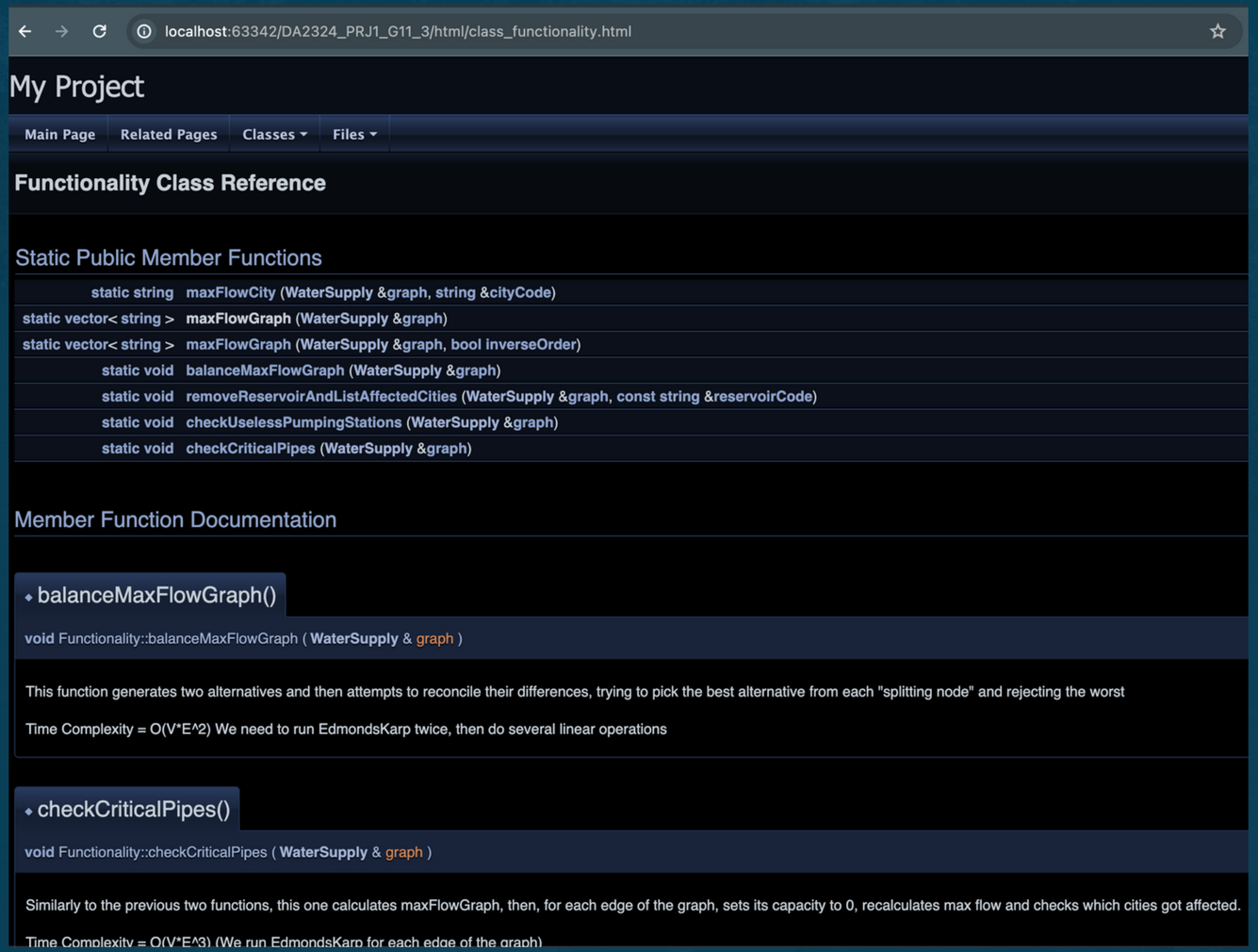
Team Participation

João: 50
Sofia: 25
Tiago: 25

EXTRA: Tests


DA2324_PRJ1_G11_3 70 ms
FileReader 4 ms
addReservoirsSmallDataSet 0 ms
addReservoirsLargeDataSet 0 ms
addStationsLargeDataSet 1 ms
addCitiesLargeDataSet 0 ms
addPipesLargeDataSet 3 ms
Functionality 66 ms
maxFlowCity 4 ms
maxFlowGraph 13 ms
maxFlowGraphCleansFirst 19 ms
balanceMaxFlowGraph 27 ms
balanceMaxFlowGraphWithMadeiraSample 3 ms

EXTRA: Doxygen



Thank you for your attention