VILNIUS UNIVERSITY
ŠIAULIAI ACADEMY

BACHELOR PROGRAMME SOFTWARE ENGINEERING

Object-Oriented Programming (OOP)

C# Final Project

Github report: https://github.com/Sifaurrahman/FileSyncNetScout

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a) Purpose of Project:

FileSyncNetScout = A Distributed File Indexing System Using C#

This C# console-based project demonstrates inter-process communication, multithreading, and CPU core control through a Master-Agent architecture using named pipes.

b) System Overview

The system consists of three console applications:

AgentA scans `.txt` files and sends word counts via pipe `agent1`

AgentB performs the same via pipe `agent2`

Master receives data from both agents, merges and displays word count index

Each component runs on a dedicated CPU core.

c) Core Features

- Word Indexing
- Multithreading
- Named Pipe Communication
- CPU Affinity via `Processor.ProcessorAffinity`
- Git-based Versioning

d) Architecture Summary

`AgentA` and `AgentB`: Read `.txt` files, count words, send data through named pipes

`Master`: Uses 2 threads to read from pipes concurrently, merges and prints final result.

e) Technology Stack

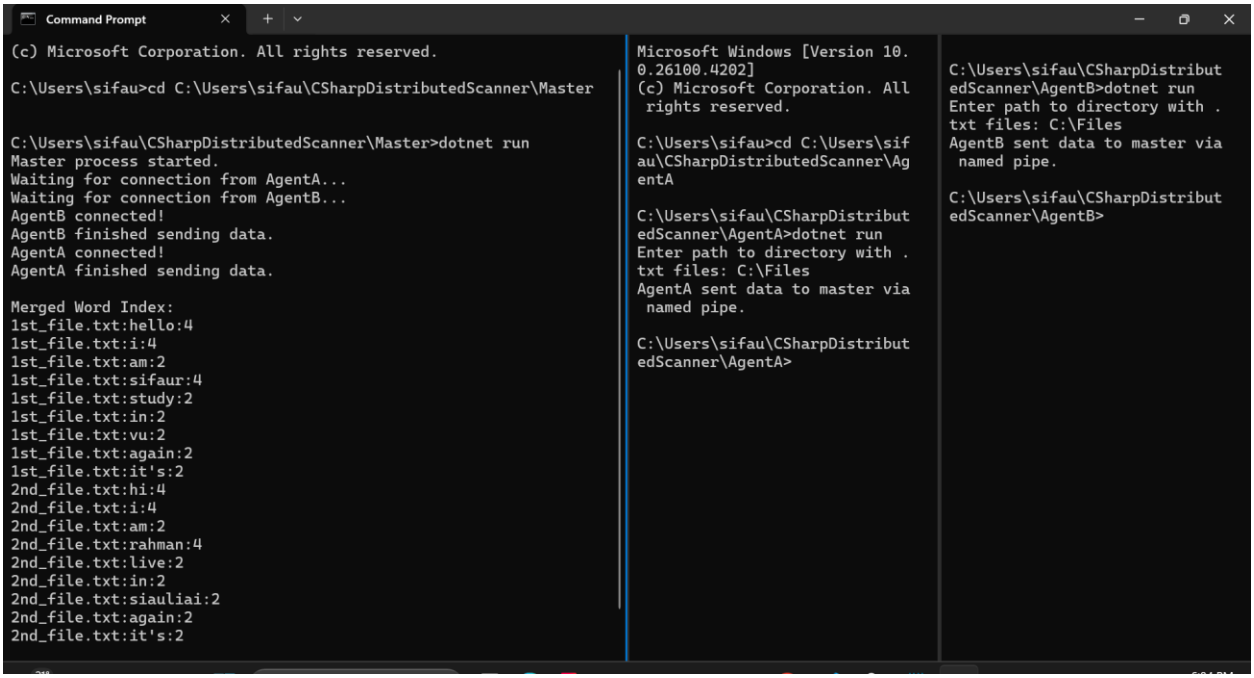
Technology	Used For
C# (.NET 7)	All 3 console apps
Named Pipes	Agent-Master communication
Threads	Concurrent file I/O and pipe listening
CPU Affinity	Core isolation of processes
VS Code + Git	Development + version control

f) CPU Affinity Logic

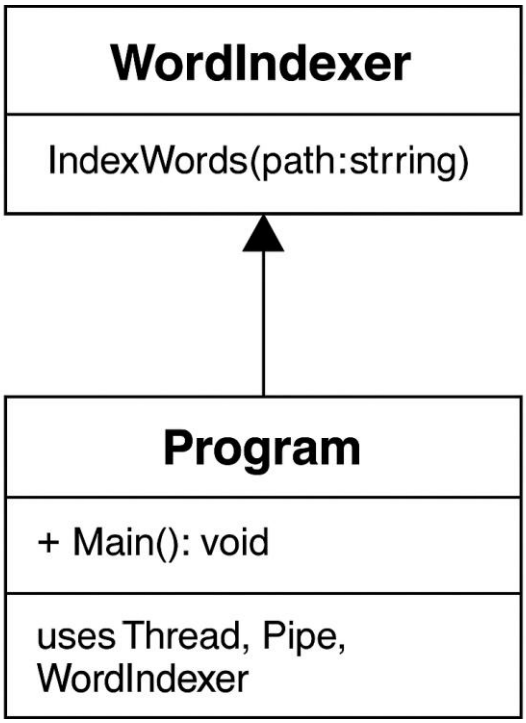
To run each app on its own CPU core:

```csharp

Process current = Process.GetCurrentProcess();

current.ProcessorAffinity = (IntPtr)(1 << N);

```

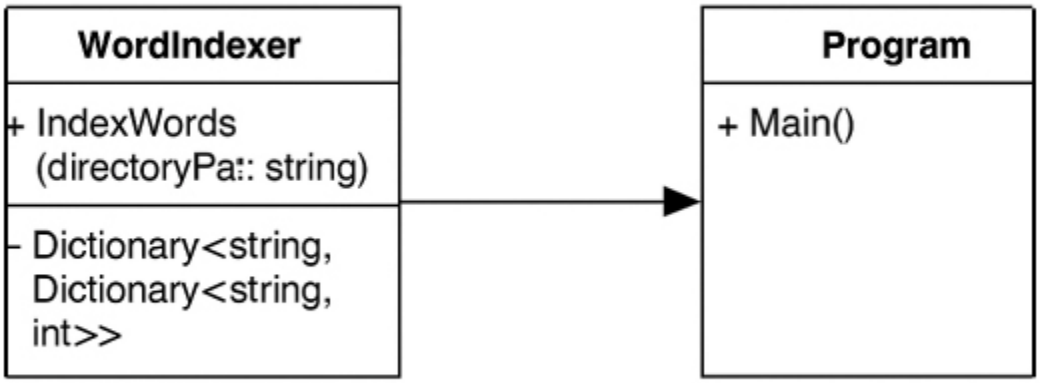
g) Screenshots



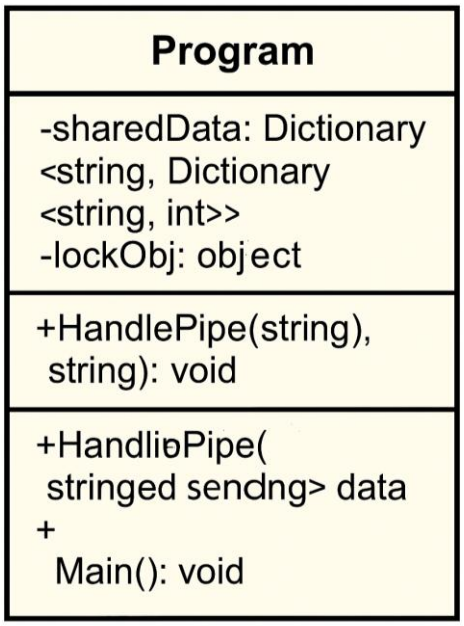
h) UML Diagram:



UML Diagram for AgentA



UML diagram for AgentB



UML diagram for Master

i) Challenges and Resolutions

Challenge	How I solve it
Named pipe connection errors	Ensured Master starts before Agents
Null input warning in Console.ReadLine()	Used null-check with ?? ""
CPU Affinity warning	Added correct using System.Diagnostics