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About the Project

The project's task is to develop an application to render Mandelbrot set, providing a 'Client' and 'Server' which together renders parts of the Mandelbrot set. Server accepts requests on a TCP port. The client spreads the workload over a set of servers.

The project is published on GitHub

<https://github.com/alaulwan/Fractals>

To clone the repository

<https://github.com/alaulwan/Fractals.git>

Interface

The server accepts a request that has this form:

GET /mandelbrot/{min_c_re}/{min_c_im}/{max_c_re}/{max_c_im}/{x}/{y}/{inf_n}

It should return a gray-scale image of dimension x times y , where each pixel corresponds to the number of iterations it takes, until $|z_n| > s$, $z_{n+1} = z_n^2 + c$, (c is complex, $s \in \mathbb{R}^+$).

In the current version of the server, $s=2$ by default.

The client is a command-line tool with these arguments:

min_c_re min_c_im max_c_re max_c_im max_n x y divisions list-of-servers

Tools Used

For development, the following tools are used:

- Eclipse (Java IDE)
- Java SE Development Kit 8 (JDK-8)

Manual ([Demo video: https://youtu.be/2D1pf9yfhQI](https://youtu.be/2D1pf9yfhQI))

Download client.jar and server.jar from [Here](#).

To run the server and the client, in a console, in the same directory as .jar files is stored:

For the server:

java -jar server.jar {port}

For the client:

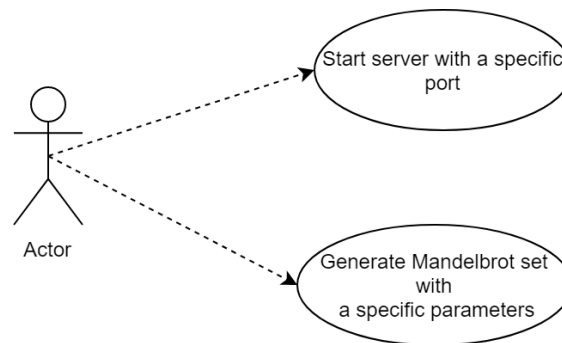
java -jar client.jar {min_c_re} {min_c_im} {max_c_re} {max_c_im} {max_n} {x} {y} {divisions} {list-of-servers}

The result will be saved in the same folder of the client.jar with the name Mandelbrot.pgm.

OBS: It requires a **JRE-8** (Java Runtime Environment) or later to be installed on your host machine. You find the latest version to download at

<https://www.java.com/inc/BrowserRedirect1.jsp?locale=en>

Use Case Diagram



Use Case Descriptions

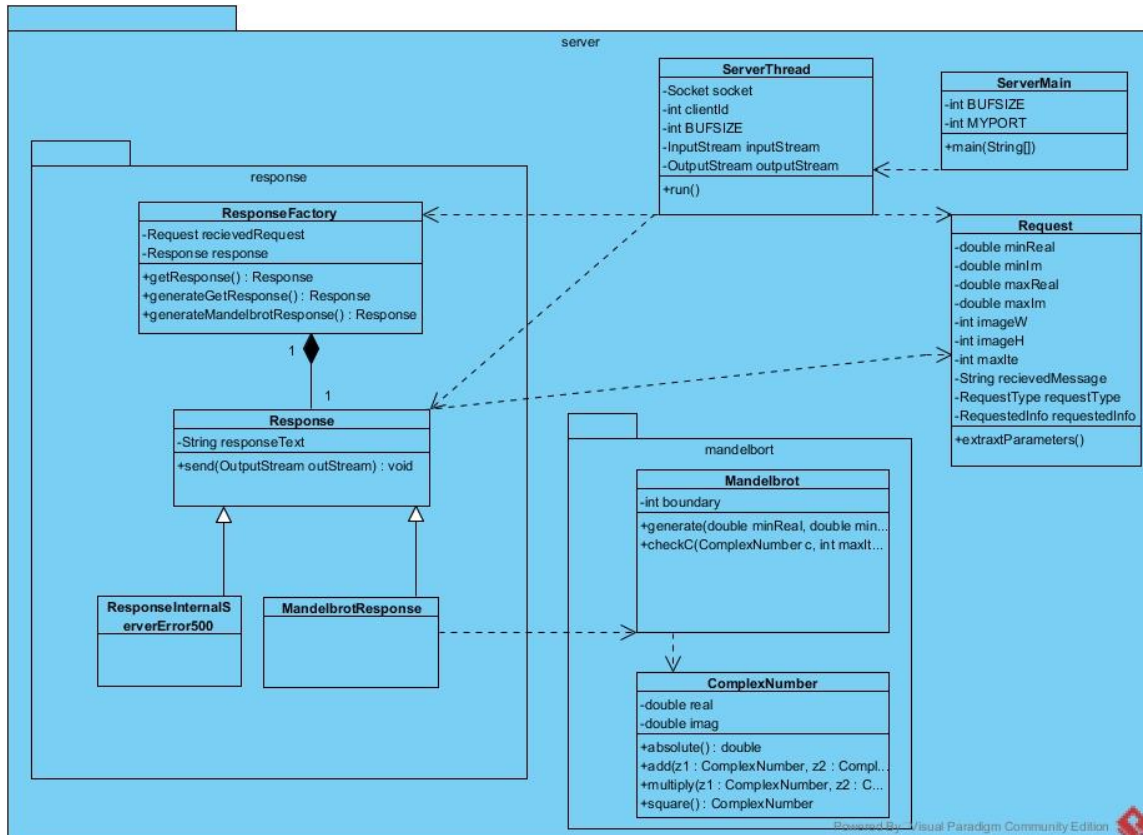
Use case #1	
Actors:	Any one
Description:	Run the server
Pre-Conditions:	<ul style="list-style-type: none">JDK-8 is installed.server.jar is downloaded.
Main flow:	<ol style="list-style-type: none">In the console, navigate to the same folder as server.jarType the command java -jar server.jar {port}The server is running and listen to the defined port.
Post-Condition:	The server is running on the defined port.
Alternative flow:	
2.a	The user does not define the port.
3.a	The server listens to the default port 8888.

Use case #2	
Actors:	Any one
Description:	Generate Mandelbrot set
Pre-Conditions:	<ul style="list-style-type: none">JDK-8 is installed.client.jar is downloaded.One or more server is running
Main flow:	<ol style="list-style-type: none">In the console, navigate to the same folder as server.jarType the command java -jar client.jar {min_c_re} {min_c_im} {max_c_re} {max_c_im} {max_n} {x} {y} {divisions} {list-of-servers}The client sends a request to servers-list.Each server send back a response.The client merge the received responses and save the result in .pgm file in the same directory of client.jar.
Post-Condition:	Mandelbrot set is generated and saved in .pgm file.
Alternative flow:	
2.a	The user does not provide all parameters.
3.a	The client view an error message.

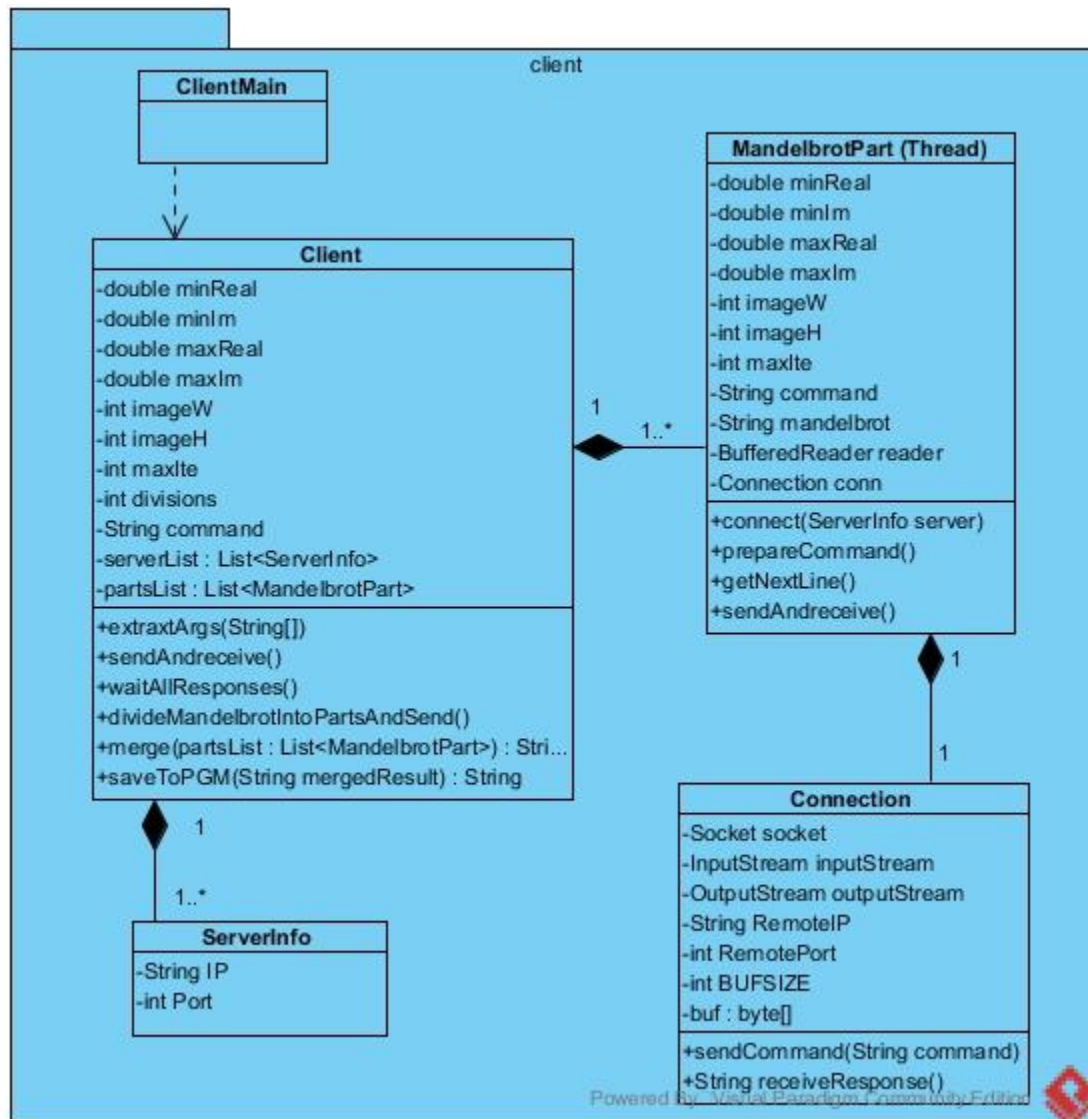
Class Diagram

For the server:

The benefits of having the class “ResponseFactory” and the abstract class “Response” is to make it easier to add more functionality to the server in the future.

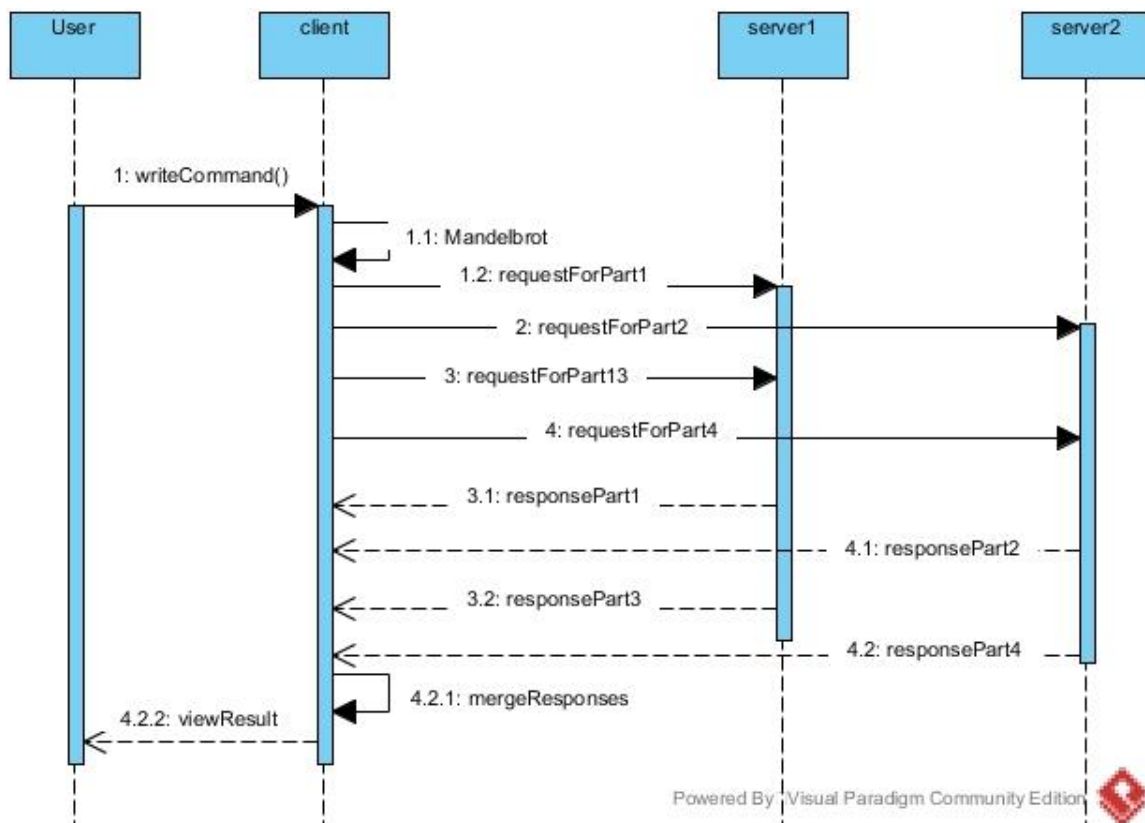


For the client:



Sequence Diagrams

This sequence diagram for division = 2, and list of two servers.



The following sequence diagram illustrate how a server manipulate the request:

