Laboratory work 1

Goal of the work – is twofold:

- Develop a specification of a distributed system using formal notation (notation has to be approved by lecturer);
- Develop a distributed system with AI functions implementation based on formal notation

The work consists of 3 parts. Only 3rd part is optional (in that case no max grade is possible)

Part 0: formal specification

Assignment 0. Develop a specification of a distributed system using formal notation (notation has to be approved by lecturer).

This part is evaluated by max 1 point.

Part 1: Web API

Assignment 1. Create your own use case using the services offered by *Azure AI Services* (until July 2023 it was known as *Azure Cognitive Services*). The selected service should be configured in the Azure portal and a service client should be created using WebAPI.

The list of Available Azure AI services can be found - https://learn.microsoft.com/en-us/azure/ai-services/what-are-ai-services

The API service variant of the assignment is calculated by modulo operation (the digital part of student's internal code modulo 12) and is presented in Table 1.

Table 1. Azure AI services

Variant	Service	Description
0	Vision icon Vision	Analyze content in images and videos.
1	Azure AI Search icon Azure AI Search	Bring AI-powered cloud search to your mobile and web apps.
2	Azure OpenAI Service icon Azure OpenAI	Perform a wide variety of natural language tasks.
3	Bot service icon Bot Service	Create bots and connect them across channels.
4	Content Safety icon Content Safety	An AI service that detects unwanted contents.
5	Custom Vision icon Custom Vision	Customize image recognition for your business.
6	Document Intelligence icon Document Intelligence	Turn documents into intelligent data-driven solutions.
7	Face icon Face	Detect and identify people and emotions in images.
8	Immersive Reader icon Immersive Reader	Help users read and comprehend text.
9	Language icon Language	Build apps with industry-leading natural language understanding capabilities.
10	Speech icon Speech	Speech to text, text to speech, translation, and speaker recognition.

11	Translator icon Translator	Use AI-powered translation technology to translate more than 100 in-use, at-risk, and endangered languages and dialects.

In case services are unavailable or paid, pickup the next in a sequence assignment variant.

This part is evaluated by max 2 points.

Part 2: State management

Assignment 2. To program the structure given in the scheme using the Azure AI Services service appointed in the Assignment 1, the requests must be organized so that the use of the service remains free, i.e. to limit the number of requests (in the picture this corresponds to the 30s requirement). Program may be performed either using option A or B – see figures 1 and 2 below.

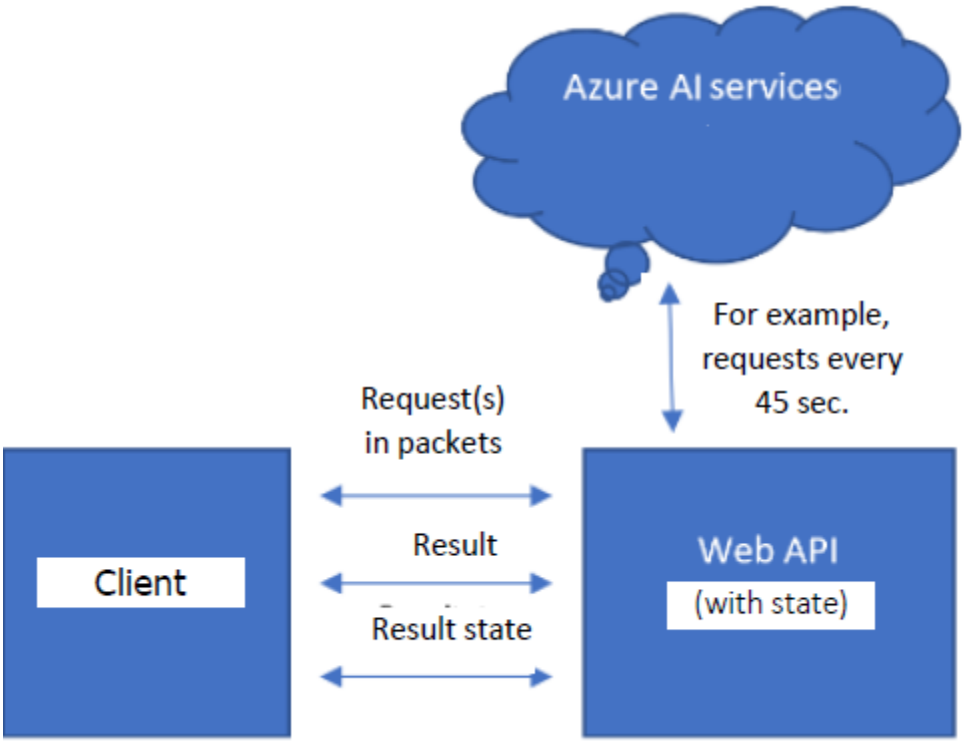

Figure 1. Option A

For example, a Client asks for a set of image recognition (sent through different packages) through a Web API program. The last sends requests to recognize each image using specific interval. A state per each image is stored at Web API. A Client may ask for results of recognition of specific images. Web API replies with Results state and Result (if recognition is ready).

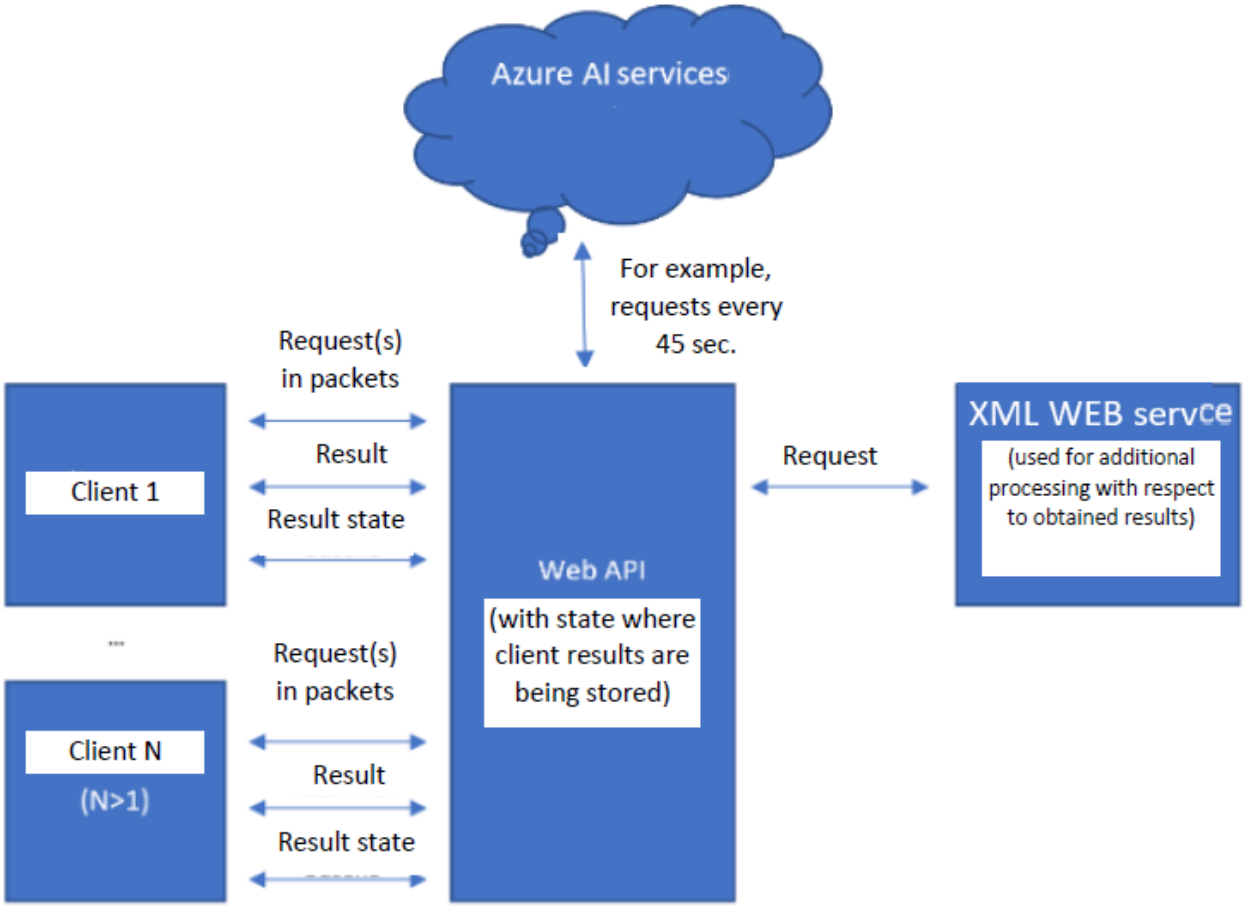

Figure 2. Option B

Example of additional processing could be a translation of the recognition results (see example description of the figure above).

This part is evaluated by either max 2 points for Option A or max 3 points for Option B.

Part 3: gRPC

Assignment 3. Make changes to the system implemented in the second part by introducing subsystems communicating with the help of gRPC technology.

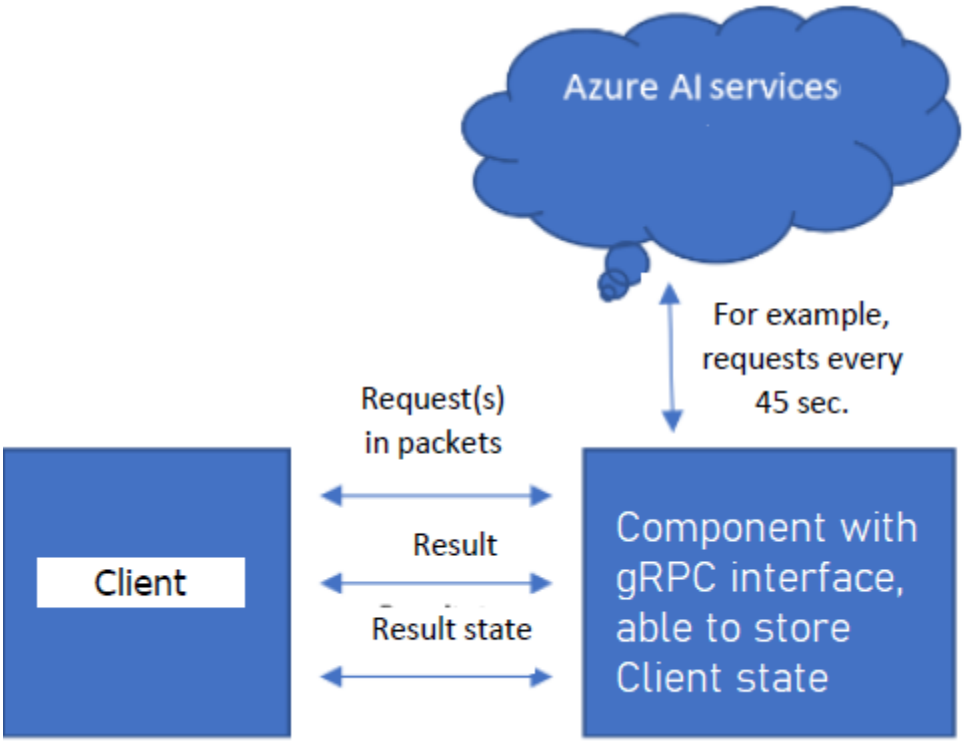

Figure 3. Option C

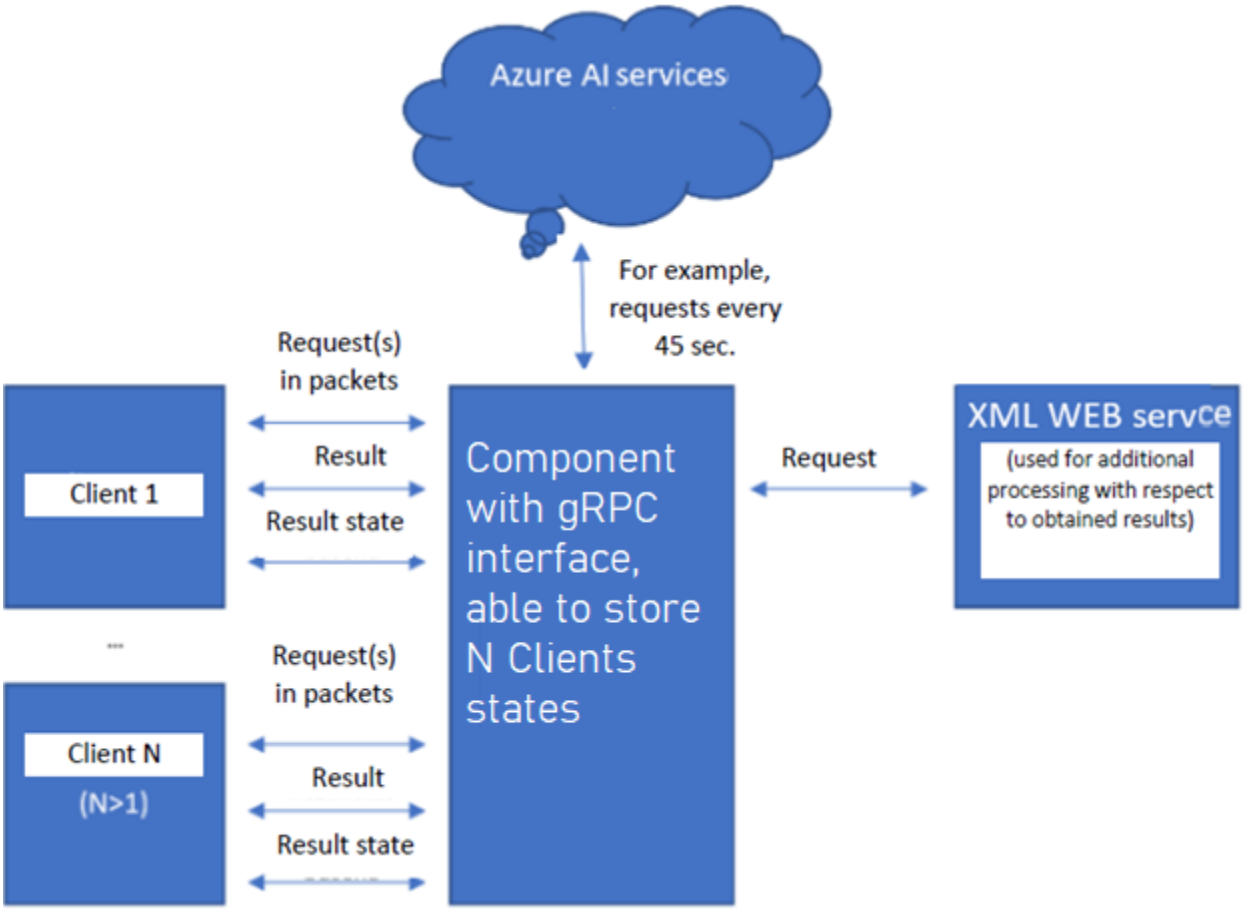

Figure 4. Option D

This part is evaluated by either max 2 points for Option C or max 3 points for Option D.

Submission deadline – **1 of October (17:00)**.