Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	03 October 2022
Team ID	PNT2022TMID12764
Project Name	Real-Time Communication System Powered by AI for Specially Abled
Maximum Marks	4 Marks

Technical Architecture:

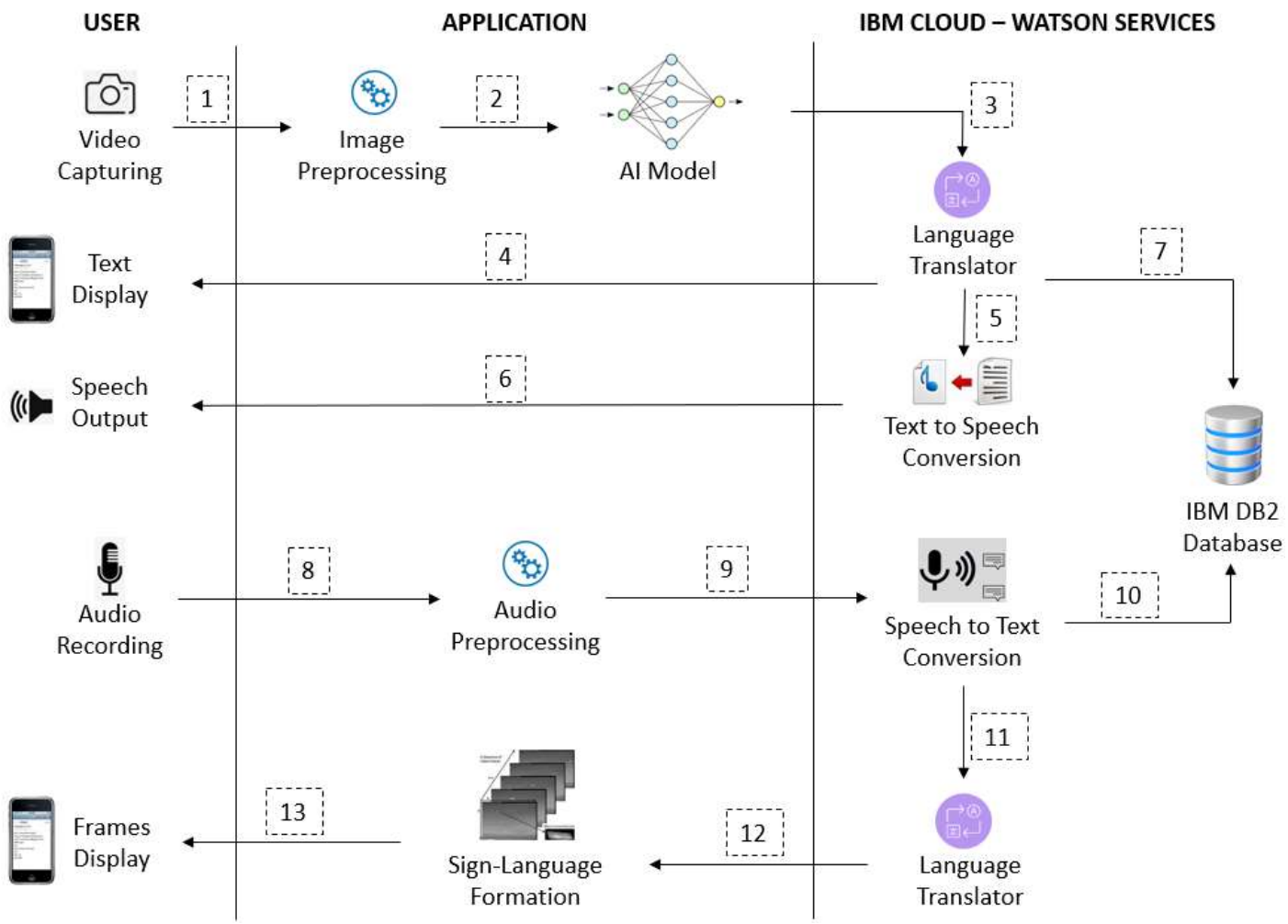
The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode

Reference: https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/

Guidelines:

- Include all the processes (As an application logic / Technology Block)
- Provide infrastructural demarcation (Local / Cloud)
- Indicate external interfaces (third party API's etc.)
- Indicate Data Storage components / services
- Indicate interface to machine learning models (if applicable)



1 - video of the sign-language should be taken at the user side and it should be given to the image pre-processing stage of the application.

2 - after image pre-processing, the processed image should be fed to AI model for gesture recognition

3 -the English text output from the AI model should be fed to the language translator of the IBM Cloud. This is optional as it should be done if the user chooses different language in the settings page

4 - the translated text should be fetched by the application and displayed at the user side.

5 - the translated text should be converted to speech using IBM text to speech conversion.

6 - the speech should be given as output through speaker at the user side

7 - the resultant data is stored in the database. This is optional and should be done if the user preferred to backup data

8 - Audio should be recorded at the user's side and should be given to audio pre-processing stage in the application

9 - the processed audio is given to the speech to text conversion system in the IBM Watson cloud

10 - the converted text is stored in the database. This is optional and should be done if the user preferred to backup data

11 - the English language text is translated to the user's desired language. This is optional as it should be done if the user chooses different language in the settings page

12 - the translated text is fetched at the application side and suitable sign-language is formed from the available images

13 – The frames are continuously displayed as video at the user side.

Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	Web UI	Flask UI – HTML in Frontend and Python in Backend
2.	Image Pre-processing	The input images from the video are pre-processed for adjusting dimensions, hue, saturation, zooming, flipping, shearing, etc that is suitable for the AI model	Python - Keras

3.	AI Model	The model for recognizing gestures	Convolutional Neural Network (CNN)
4.	Language Translator	The English text is converted into user desired language	IBM Watson Cloud language translator API
5.	Text to Speech conversion	The text is converted to speech	IBM Watson text to speech conversion API
6.	Audio is pre-processed	The required voice should be extracted and noise have to be filtered using digital filters	Python
7.	Speech to text conversion	The speech is converted to text	IBM Watson speech to text conversion API has to be used
8.	Sign language formation	The sign-language video has to be constructed by displaying frames from the set of available gesture images	Python
9.	Database	For storing user information, text files, etc	IBM DB2 Cloud database – SQL database

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1.	Security Implementations	Encrypting data while transferring between app and cloud database	SHA-256
2.	Scalable Architecture	The architecture is divided into 3-tire: Web UI, Cloud Services and Database. Each can be developed and scaled up independently of others.	Flask for Web UI, IBM Watson cloud service APIs, IBM Watson DB2 database
3.	Availability	The registration details of the user and other structural data must be stored in the database so	IBM Watson DB2 database, IBM Watson cloud services

S. No	Characteristics	Description	Technology
		that if the user changes the device or reinstall the app, he/she can continue without any difficulty. The AI model must be periodically developed and updates must be released. This new update availability must be notified to the users through the app. The user must be able to update during his/her desired time	

References:

https://c4model.com/

https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/

https://www.ibm.com/cloud/architecture

https://aws.amazon.com/architecture

https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fda90d