Apollo Projects Demo 3

GENDAC
SOFTWARE ENGINEERING

Sales Pitch

Sign Sync is a real-time translation system that bridges the communication gap between the Deaf and hearing communities. Using AI, motion capture, and natural language processing, our system can translate speech into sign language animations and sign language into text instantly.

Why is this important? Today, millions of Deaf individuals face barriers in everyday conversations — at work, in education, and in public services. Current solutions are either too slow, too limited, or require human interpreters. Sign Sync provides an accessible and scalable alternative.

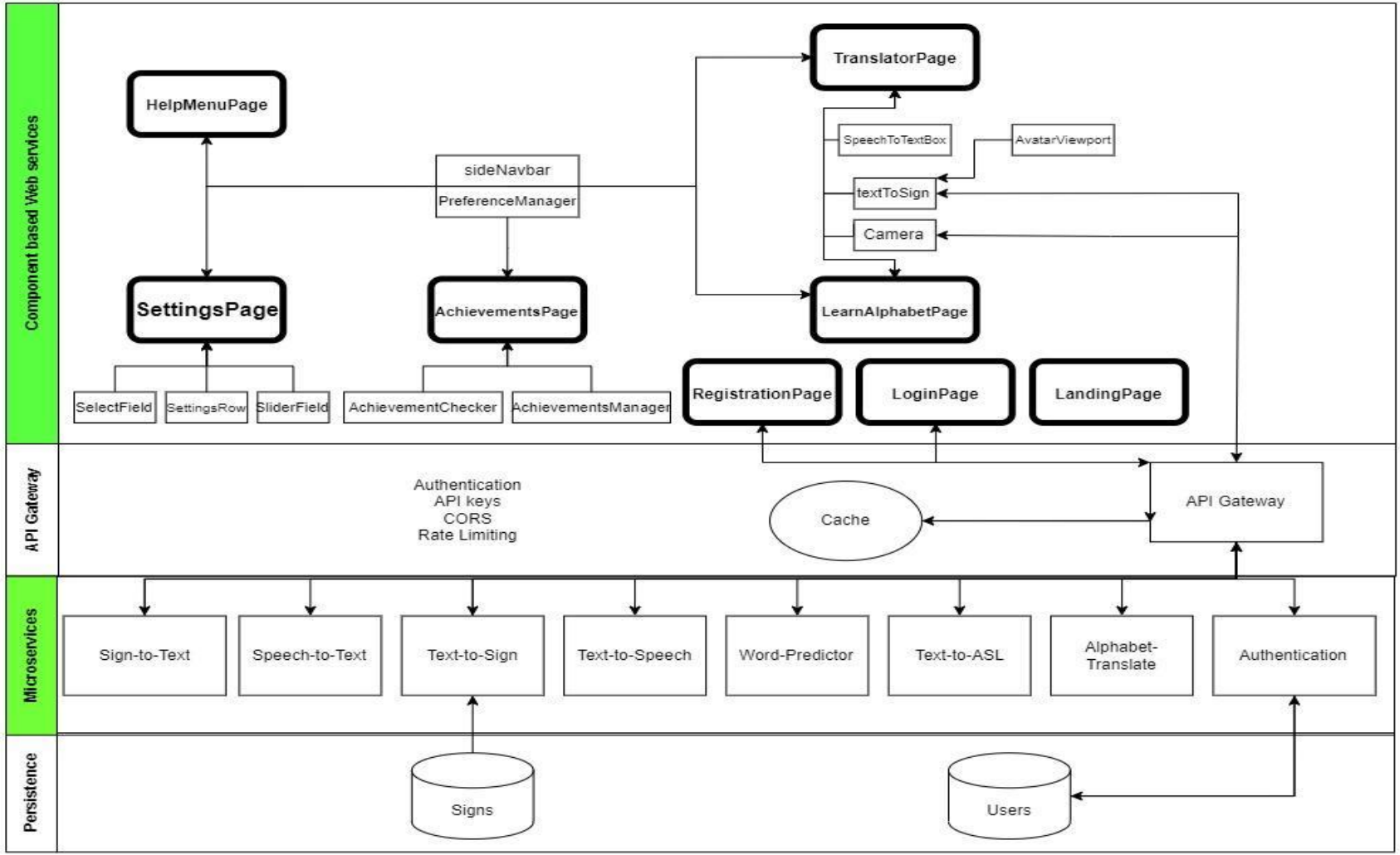
Our solution is built as a set of microservices, each responsible for a key translation step - all integrated through a central API gateway. This makes the system modular, scalable, and easy to extend in the future.

In short: Sign Sync empowers inclusive communication, making real-time conversations possible across language barriers, and creating a world where everyone's voice — signed or spoken — is understood

Architecture

- N-Tier
  - Overarching Architecture
- Microservices
- Component-based
  - Web services
- Architecture diagram…

N-Tier (4)


Component based Web services
HelpMenuPage
TranslatorPage
SpeechToTextBox
AvatarViewport
sideNavbar
PreferenceManager
textToSign
Camera
SettingsPage
AchievementsPage
LearnAlphabetPage
SelectField
SettingsRow
SliderField
AchievementChecker
AchievementsManager
RegistrationPage
LoginPage
LandingPage
API Gateway
Authentication
API keys
CORS
Rate Limiting
Cache
API Gateway
Microservices
Sign-to-Text
Speech-to-Text
Text-to-Sign
Text-to-Speech
Word-Predictor
Text-to-ASL
Alphabet-Translate
Authentication
Persistence
Signs
Users

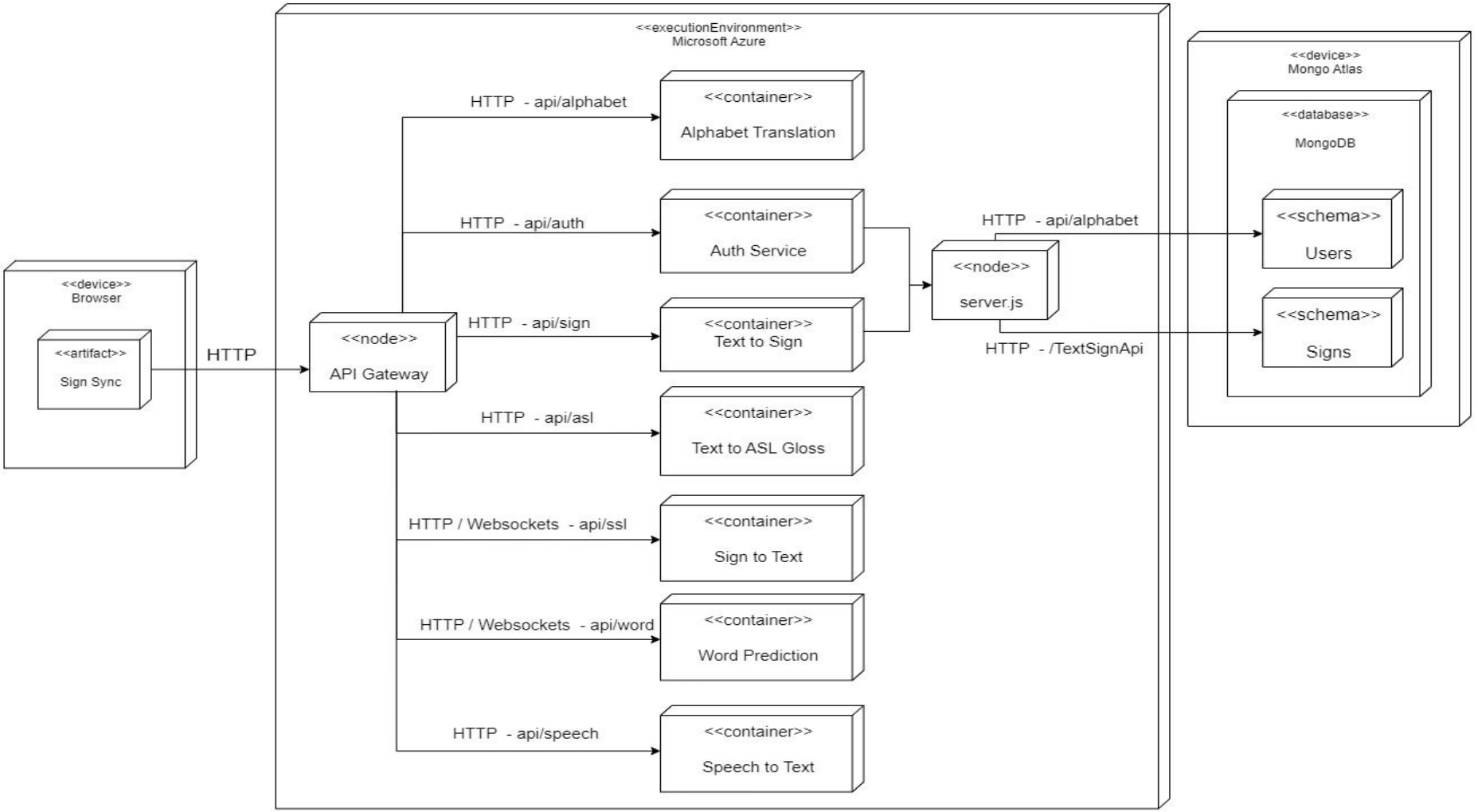
Deployment Model

- Sign sync is a web app that will be deployed via Microsoft Azure on to the internet

- The services that comprise the backend are each individually dockerised in its own container

- The target environment is Cloud-Based, due to the deployment being hosted on Azure and the database is hosted by MongoDB Atlas.

Sign Sync


<<executionEnvironment>>
Microsoft Azure
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Browser
<<artifact>>
Sign Sync
HTTP
<<node>>
API Gateway
HTTP - api/alphabet
<<container>>
Alphabet Translation
HTTP - api/auth
<<container>>
Auth Service
HTTP - api/sign
<<container>>
Text to Sign
HTTP - api/asl
<<container>>
Text to ASL Gloss
HTTP / Websockets - api/ssl
<<container>>
Sign to Text
HTTP / Websockets - api/word
<<container>>
Word Prediction
HTTP - api/speech
<<container>>
Speech to Text
<<node>>
server.js
HTTP - api/alphabet
HTTP - /TextSignApi
<<device>>
Mongo Atlas
<<database>>
MongoDB
<<schema>>
Users
<<schema>>
Signs

Live Demo

Individual contributions - Michael Stone

- Sign To Text Service
  - Train Bidirectional GRU
  - Integrate into Frontend
- Text to Speech
- Speech to Text
- Alphabet Translate Service
- Convert sentence to ASL gloss
- Sign Language Recordings for Dataset
- AI research

Individual contributions - Matthew Gravette

- Text to Sign Service
  - Creation of avatars
  - Created all animations for signs
  - Logic for playing animations - Frontend + backend
- Worked on user preferences for avatar and Text to speech
- Sign Language Recordings for Dataset
- Created initial system for translation page

Individual contributions - WJ van der Walt

- Word-Prediction Service
  - ASL grammar → Normal English Grammar
  - Phrase→Next word prediction
- API Gateway development and integration
- Speech-to-Text service
- Sign Language Recordings for Dataset
- Initial sign language model training
- AI research

Individual contributions - Jamean Groenewald

- Education Page
  - Learn Alphabet Page
  - Learn Words Page
  - Practice Alphabet Page
  - Practice Words Page
- User Login
- User Registration
- Database set up
- UI updates and design

Individual contributions - Stefan Müller

- CI/CD
- Education page (Achievements)
  - Added blur effect if user isn’t logged in
  - Made the achievements icons
  - Made custom achievements
  - Made a way to track progress

Q&A