Project Title

Software Requirement Specification

Bachelor of Science in Software Engineering

By

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1. Introduction

1.1 Purpose

This document is designed to give a fully functional report on the requirements of the game its name is Brain Tumor and Alzheimer Detection System. The Software Requirement Specification document details all the characteristics on which the Detection App. By analyzing medical imaging data, such as MRI scans and PET scans, along with relevant clinical information, the app aims to assist in the early diagnosis of brain tumors and Alzheimer's disease. Alzheimer's disease affects the structure of the brain, which can be detected through abnormalities and changes in brain images. CNNs are a type of deep learning algorithm that can automatically learn and extract features from images, making them a promising tool for Alzheimer's detection using medical imaging data.

1.2 Document Conventions

Describe any standards or typographical conventions that were followed when writing this SRS, such as fonts or highlighting that have special significance. For example, state whether priorities for higher-level requirements are assumed to be inherited by detailed requirements, or whether every requirement statement is to have its own priority.>

1.3 Intended Audience and Reading Suggestions

This document is used to advise developers, users, and other team members as:

1. Developers shall be referred to this document to understand the online tools used, performance, functionalities, and processes in this app.
2. User shall be referred to this document to observe what the app is intended to provide in term of features, functions through the user interface. The software requirement specification is planned for.

- Developers

- Users

- Marketing

- Personnel

- Testers

The remainder of the SRS document carries the outcome of

- Product functions

- User classes

- Features

- Design

- Implementation

- Hardware and Software interfaces.

- Functional • Non-functional requirements.

Audience	Use
Developers	They will use this document for guidance for design and implementation phase.
Marketing Staff	They can use this document to make advertisements for this Play store because by reading this document they will know what the system will do? How this system is different from others?
Users	They can ensure their self by reading the SRS that their needs being met in the app or not.
Testers	They will test the implementation of the project according to the SRS base.

1.4 Product Scope

This project scope is to design the mobile app based applications in software part. Preprocessing and analyzing the collected data using Python libraries such as NumPy, Pandas, and Scikit-learn. This could include tasks such as data cleaning, feature extraction, and normalization. Developing machine learning and deep learning models using Python libraries such as TensorFlow, PyTorch to detect Alzheimer's disease. This could involve developing classification models such as (CNNs) Convolutional Neural Networks. It is Scalable

1.4.1 Goal
- Introducing a web application that every user use easily and detect brain tumor and Alzheimer disease.
- This research project aims to combine the Dementia Disease to help people in early stages with the help of CNN (Image Segmentation).
- Providing a non-invasive and accessible diagnostic tool for healthcare professionals.

2. Overall Description

An Alzheimer's detection system would aim to provide early and accurate identification of the brain disease in individuals. The system should utilize non-invasive such as MMSE methods for detecting Alzheimer's disease. This could include analyzing cognitive assessments, neuroimaging data (such

as MRI scans). The product should have an intuitive and user-friendly interface that can be easily understood and operated by healthcare professionals. It should provide clear, consistent instructions and guidance for conducting tests and interpreting the results. Alzheimer's is a progressive disease, and monitoring changes in cognitive function over time is crucial for accurate diagnosis. The system could incorporate advanced machine learning algorithms to analyze large datasets and identify patterns or biomarkers that indicate early signs of Alzheimer's disease. The product should be scalable and accessible to a wide range of healthcare settings, including hospitals, clinics, and even remote or rural areas. This could involve developing a cloud-based platform or mobile application that can be easily accessed and used by healthcare professionals.

2.1 Product Perspective

Below is a summary of the main features implemented in this Detection System and they are divided according to categories to which are necessary for this app to work.

2.2 Product Functions

The major sections of the Detection App are divided into the following categories. These sections are the most important part of the App.

Main Menu Module:

- **Registration**

    Users should be Register our self to access features.

- **Login**

    Screens where users can log in to the application.

- **Select brain tumor or Alzheimer:**

    User When the detect Button is clicked, the listener checks which radio button is selected. Based on the selection, you can include the appropriate code for brain tumor detection or Alzheimer's disease detection. In this example, the selected option is printed to the console, but you can replace that code with the relevant detection algorithms and logic. Will select the brain tumor for detection and Alzheimer.

- **Brain Test**

    After the user provides their answers, the program will calculate the MMSE score and display it on

    the console.

- **About**

    The app can provide access to support networks, including online communities, forums, or helplines.

    It can also offer links to trusted resources, such as articles, that provide additional information

    and support for individuals and caregivers.

- **Logout**

  When the user will click the Logout button his profile should be logout from the App and login should popup on the screen.

- **Quit**

  When the user will click the quit button the App will be quit.

2.3 User Classes and Characteristics

We have kept the control scheme of the App simple. It consists of a simple design and the age difference doesn't matter while Using the App. The user experience is what comes to matter while Using the App.

- Use Case Diagram
- Activity Diagram of Alzheimer
- Activity Diagram of Brain Tumor

Use Case Diagram
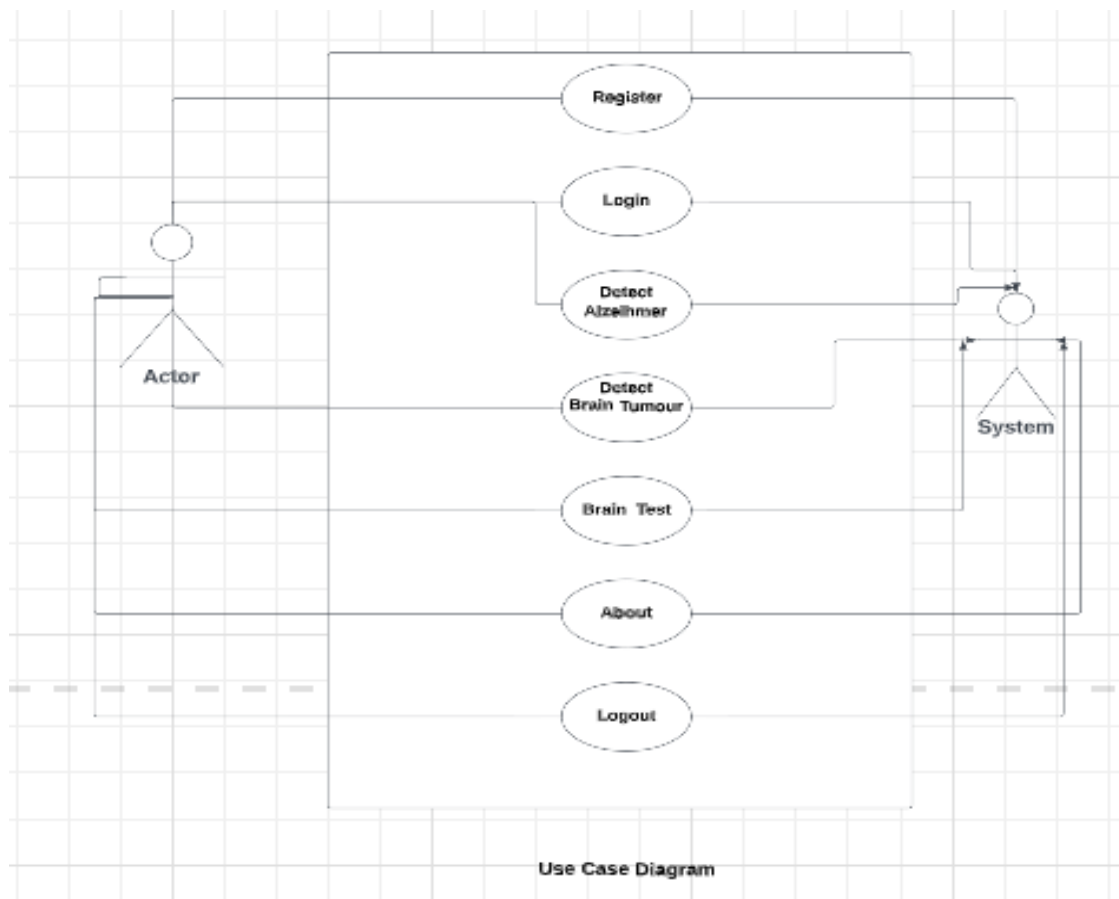
Activity Diagram of Alzheimer Detection:

Activity Diagram of Brain Tumor Detection:
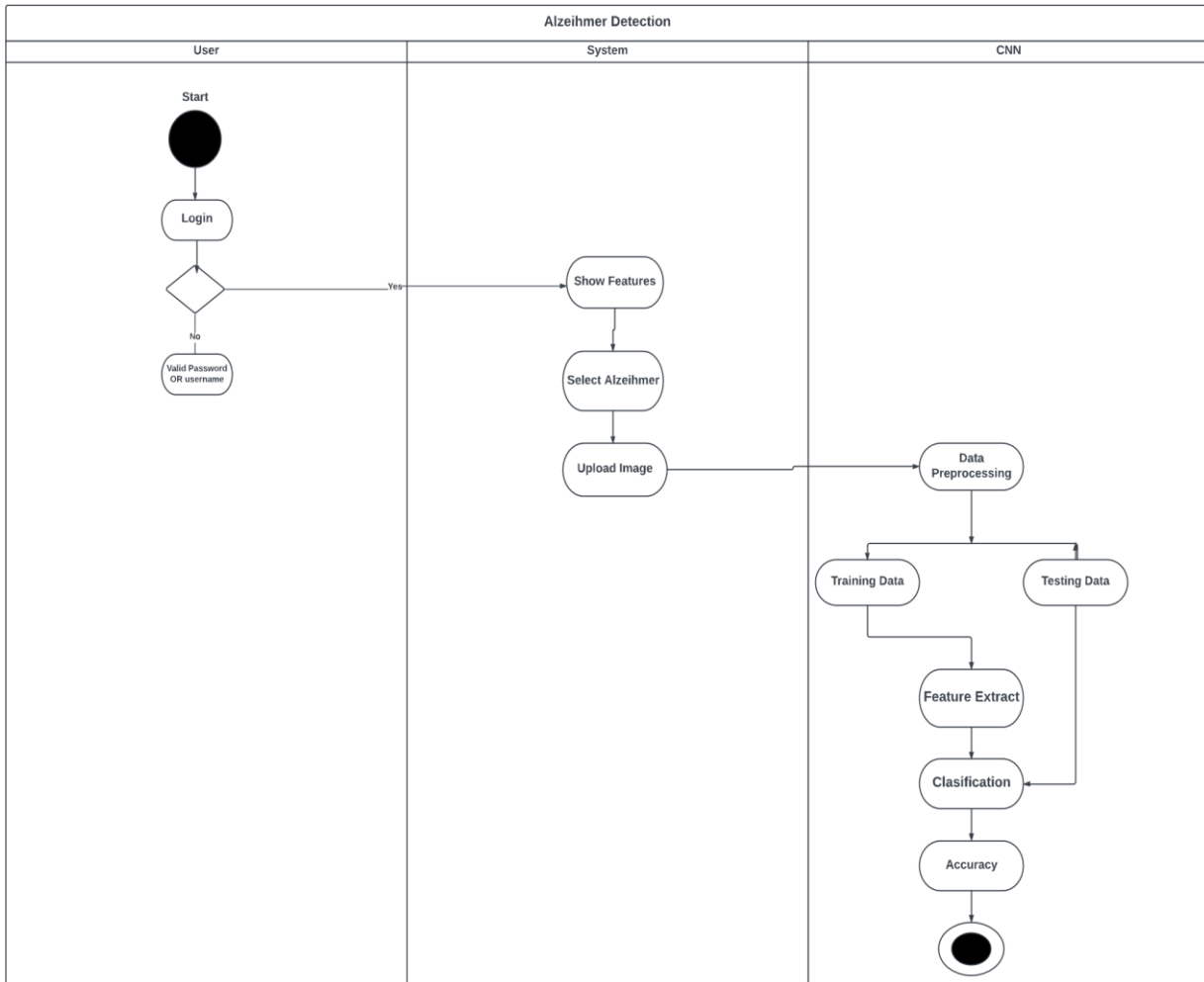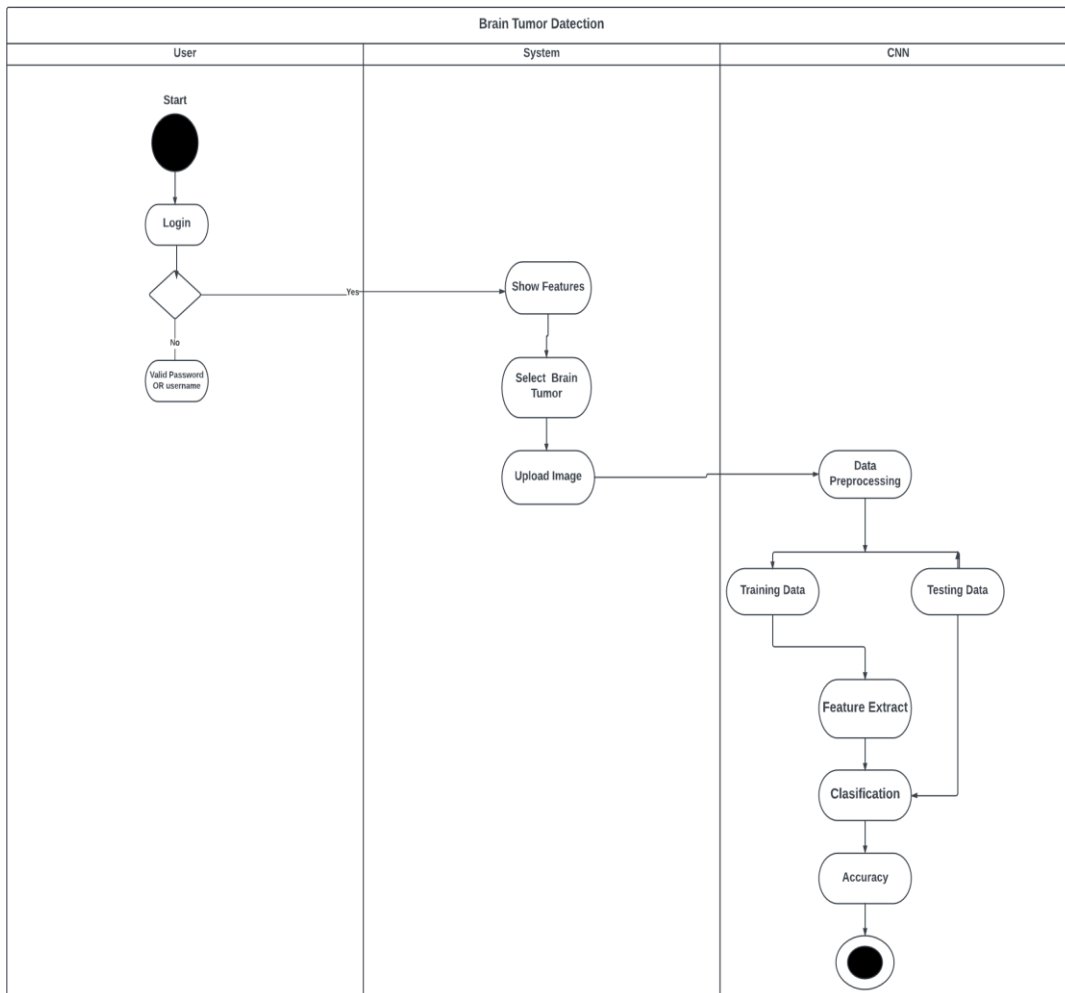

2.4 Operating Environment

This App will be on Java for Frontend and Machine Learning Algorithm to detect the disease and it will support) any android version up to 8. The android IOS support will be included in later versions.

2.5 Design and Implementation Constraints

The development of the Brain Tumor Detection Application is subject to certain constraints that may limit the options available to the developers. These constraints include:

Limited Understanding: Our current understanding of the underlying mechanisms and causes of Alzheimer's disease and brain tumors is still evolving. This can constrain the accuracy and effectiveness of solutions.

Data Availability: Availability of quality data, such as medical records, neuroimaging scans, and cognitive assessments, can pose a constraint on developing accurate and reliable solutions

Expertise and Workforce: Availability of skilled professionals, including clinicians, data scientists, and software developers, can be a constraint in developing and implementing solutions.

Clinical Trials and Validation: Conducting rigorous clinical trials and validation studies to assess the efficacy and safety of new interventions or diagnostic methods can be time-consuming and resource-intensive.

2.6 User Documentation

The App will come equipped with a separate instruction section bar in which the user when the first login if wanting can go to the instruction section bar to learn the mechanics or task of the App so that in their first time the user doesn't get confused.

2.7 Assumptions and Dependencies

<u>**Assumptions:**</u>

Availability of Patient Data: The system assumes access to relevant patient data, including medical history, cognitive assessments, neuroimaging data, and genetic testing results.
Collaboration with Healthcare Professionals: The system assumes active involvement and collaboration with healthcare professionals, including doctors, neurologists, and specialists, who have the expertise to interpret and make clinical decisions based on the system's outputs.

<u>**Dependencies:**</u>

Availability of Diagnostic Tools and Data: The system depends on the availability of cognitive assessment tools, neuroimaging facilities, and genetic testing laboratories to collect the necessary data for analysis.

Technical Infrastructure: The system depends on reliable and secure technical infrastructure, including servers, databases, and networks, to store and process patient data.

User Training and Adoption: The system's success depends on healthcare professionals' understanding and adoption of the system, including proper training on how to use and interpret its outputs effectively.

3. External Interface Requirements

3.1 User Interfaces

The Interface of this App consist of multiple sections:

Registration

Users should be Register our self to access features.

Login

Screens where users can log in to the application.

Select brain tumor or Alzheimer:

User When the detect Button is clicked, the listener checks which radio button is selected. Based on the selection, you can include the appropriate code for brain tumor detection or Alzheimer's disease detection. In this example, the selected option is printed to the console, but you can replace that code with the relevant detection algorithms and logic. Will select the brain tumor for detection and Alzheimer.

Brain Test

After the user provides their answers, the program will calculate the MMSE score and display it on the console.

About

The app can provide access to support networks, including online communities, forums, or helplines.

It can also offer links to trusted resources, such as articles, that provide additional information and support for individuals and caregivers.

Logout

When the user will click the Logout button his profile should be logout from the App and login should popup on the screen.

Quit

When the user will click the quit button the App will be quit.

3.2 Hardware Interfaces

The only devices that will be compatible with this App are the ones that will be android versions8.0. This App will only be released for the Android versions. The system need internet connection to Start the App

3.3 Software Interfaces

Java is used for creating the user interface. Python Script that will be detect the disease what the user want.

3.4 Communications Interfaces

Internet Connectivity: The application should have access to the internet to retrieve and send data, facilitate real-time messaging, and receive notifications.

Email: Integration with email services to send email verifications, password reset links, and other account-related communications

4. System Features

The following system features describe the major services provided by the Alzheimer, Brain, and Brain Test(MMSE) Application

4.1 System Feature 1: User Registration and Login

Description and Priority: This feature allows users to create an account and log in to the application. It is of high priority as it forms the foundation for user engagement and access to other features.

Stimulus/Response Sequences:

- User opens the application.
- User selects the registration option.
- User enters the required information (e.g., name, email, password).
- User submits the registration form.
- System validates the information and creates a user account.
- User logs in using the registered email and password.
- System verifies the credentials and grants access to the application.

4.2 System Feature 2: Select Brain Tumor and Alzheimer.

Description and Priority: This feature allows users to select the brain tumor or Alzheimer what the user want to check.

Stimulus/Response Sequences:

1.Use Case: Brain Tumor Detection

- **Req-1:** Medical professionals need to accurately detect brain tumors in patients.
- **Solution:** Machine learning algorithms can be trained to analyze medical images, such as MRI scans, to identify potential brain tumors.
- **Workflow:**
    1. **Data Collection:** Gather a large dataset of labeled brain MRI scans, including both tumor and non-tumor cases.
    2. **Preprocessing:** Normalize the images, remove noise, and segment the brain region.
    3. **Feature Extraction:** Extract relevant features from the preprocessed images, such as shape, texture, and intensity.
    4. **Model Training:** Utilize machine learning algorithms, such as convolutional neural networks (CNNs), to train a model on the labeled dataset.
    5. **Model Evaluation:** Assess the performance of the trained model using evaluation metrics, such as accuracy, sensitivity, and specificity.
    6. **Deployment:** Deploy the trained model as a tool for assisting radiologists in diagnosing brain tumors by analyzing new MRI scans and providing predictions.

2.Use Case: Alzheimer's Disease Detection

- **Req-1:** Early detection and prediction of Alzheimer's disease can help in managing the condition and providing appropriate care.
- **Solution:** Machine learning algorithms can be utilized to analyze various types of data, including clinical assessments and neuroimaging, to predict the likelihood of developing Alzheimer's disease.
- **Workflow:**
    1. **Data Collection:** Gather a dataset comprising clinical data, cognitive assessments, and neuroimaging scans from individuals with and without Alzheimer's disease.
    2. **Data Preprocessing:** Clean the data, handle missing values, and perform feature selection or extraction if needed.

3. **Feature Engineering:** Extract relevant features from the data, such as demographic information, cognitive test scores, and brain volume measurements.
4. **Model Training:** Train machine learning models, such as decision trees, random forests, or support vector machines, on the labeled dataset.
5. **Model Evaluation:** Evaluate the performance of the trained models using metrics like accuracy, precision, recall, and area under the curve (AUC).
6. **Deployment:** Deploy the trained model as a predictive tool that can assess the risk of developing Alzheimer's disease based on new patient data, aiding in early intervention and treatment planning.

4.3 Brain Test

- Screening for cognitive impairment
- Diagnosis and monitoring of dementia
- Research and clinical trials
- Evaluation of response to treatment

4.4 About

1. **Problem:** Users need reliable and accurate information about Alzheimer's disease and brain tumors to raise awareness, understand the conditions, and access relevant resources.
2. **Solution:** The "About" section in the mobile app provides educational content, resources, and support related to Alzheimer's disease and brain tumors.
3. **Workflow:**
   - **Introduction:** The "About" section begins with an overview of Alzheimer's disease and brain tumors, explaining what they are, their impact on individuals and their families, and the importance of early detection and treatment.
   - **Symptoms and Risk Factors:** Detailed information is provided about the symptoms and risk factors associated with Alzheimer's disease and brain tumors. This helps users identify potential warning signs and understand their susceptibility to these conditions.
   - **Diagnosis and Treatment:** The "About" section offers insights into the diagnostic procedures used for Alzheimer's disease and brain tumors, including imaging techniques and cognitive assessments. It also provides an overview of treatment options, such as surgery, chemotherapy, radiation therapy, or medications, highlighting the importance of personalized care plans.

4.5 Logout

4.5.1 Description and Priority
When the User will click the Logout button his profile should be logout from the App and login should popup on the screen.

4.5.2 Stimulus/Response Sequences
User will be logout from his profile.

4.5.3 Functional Requirements
REQ-1: The user must be logout from the profile on clicking the Logout button.

4.6 Quit

4.6.1 Description and Priority When the User will click the quit button the App will be quit.
4.6.2 Stimulus/Response Sequences
App will close.
4.6.3 Functional Requirements
REQ-1: When the user clicks the quit button, the App shall be closed.
REQ-2: App Button shall also perform the closing operation.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

For any software development, we just need to build and design software capabilities for a better job. The most important thing is we can be managed a system regularly and updating the system at the time. One of the most important requirements is finding and removing the bugs that are installed whenever we updating the system.

5.2 Safety Requirements

There will be no damage, harmful to install Brain Tumor and Alzheimer Detection System on device and other applications.

5.3 Security Requirements

By using this App there will be no harmful action on other applications and no theft of any information from our App will not be hacked. No experience and authentication is required and to upload MRI then detect they have disease or not.

5.4 Software Quality Attributes

To guarantee consistency and well-being, this firstly will answer to the questions to detect your brain health. For more mobility and flexibility, after completed the MMSI and MTT test it will the sign of Alzheimer and brain tumor then we need to go MRI and scan further.

5.5 Business Rules

If a patient exhibits cognitive decline and memory impairment, they should be referred to a specialist for further evaluation and potential diagnosis of Alzheimer's disease. All patient information related to Alzheimer's disease and brain tumors must be handled in compliance with

applicable privacy laws and regulations, such as HIPAA (Health Insurance Portability and Accountability Act). A multidisciplinary team consisting of neurologists, neurosurgeons, radiologists, psychologists, and oncologists should collaborate to provide comprehensive care for patients with Alzheimer's disease or brain tumors. Collaboration with relevant organizations, such as patient advocacy groups, research institutions, and government agencies, can help promote knowledge sharing, fundraising efforts, and public awareness campaigns related to Alzheimer's disease and brain tumors.

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