**Solution Documentation**

**Overview**

This solution is a .NET 8-based microservice architecture that includes a Worker Service project (IFAS.MS.Job) and other supporting components. The primary purpose of the solution is to handle background tasks, synchronization, and data export operations efficiently. It leverages Hangfire for task scheduling and includes configurable settings for seamless operation. We are using Adaptive logic to check the internet speed and ensuring the possible number of objects (Batch Size) can be processed using current internet speed.

**Adaptive logic**

Adaptive logic in AI refers to the ability of a system to adjust its reasoning and decision-making processes based on new information and changing environments. Unlike static AI, which relies on pre-defined rules, adaptive logic continuously learns, adapts, and improves its performance over time. This is achieved through techniques like machine learning, where the AI system analyzes data, identifies patterns, and refines its algorithms to optimize outcomes.

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**Projects in the Solution**

**1. IFAS.MS.Job**

This is the core Worker Service project responsible for running background tasks. It includes the following key components:

**Key Files**

* **Worker.cs**:
  + Implements the **BackgroundService** class to run background tasks.
  + Executes periodic tasks such as data export and synchronization.
* **IFASMSJobService.cs**:
  + Provides the main service logic for handling job-related tasks.
  + Interacts with other services like ExportService to perform operations.
* **IIFASMSJobService.cs**:
  + Defines the interface for IFASMSJobService, ensuring abstraction and testability.
* **MSSettings.cs**:
  + Represents configuration settings for the microservice.
  + Maps to the **MSSettings** section in appsettings.json.
* **MicroserviceApiOptions.cs**:
  + Represents API configuration options for interacting with external microservices.
  + Maps to the **MicroserviceApi** section in appsettings.json.
* **appsettings.json**:
  + Contains configuration settings for the application, including:
    - Logging levels.
    - Database connection strings.
    - Microservice API base URL.
    - Microservice-specific settings like CompanyId, BatchSize, and export intervals.

**Key Features**

* **Background Task Execution**:
  + The Worker class runs tasks at regular intervals, such as exporting data and performing synchronization.
* **Configurable Settings**:
  + Settings like BatchSize and ExportIntervalInMinutes are configurable via appsettings.json.
* **Database Integration**:
  + Uses connection strings (**HangfireConnection** and **IFASConnection**) to interact with SQL Server databases.
* **API Integration**:
  + Interacts with external APIs using the MicroserviceApiOptions configuration.

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**2. IFAS.MS.Synchronization**

This project handles synchronization and export logic.

**Key Files**

* **ExportService.cs**:
  + Implements the logic for exporting data in batches.
  + Works with the **MSSettings** configuration to determine batch size and intervals.
* **IExportService.cs**:
  + Defines the interface for ExportService, ensuring abstraction and testability.

**Key Features**

* **Data Export**:
  + Exports data in batches based on the BatchSize setting.
* **Synchronization**:
  + Ensures data consistency between systems.

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**3. IFAS.MS.WebAPI**

This project provides API endpoints for synchronization.

**Key Files**

* **MSSynchronizationController.cs**:
  + Exposes endpoints for synchronization operations.
  + Interacts with the ExportService to trigger exports and other tasks.

**Key Features**

* **API Endpoints**:
  + Provides RESTful endpoints for managing synchronization tasks.

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**Configuration**

**appsettings.json**

The appsettings.json file contains the following key sections:

1. **Logging**:
   * Configures logging levels for the application and Hangfire.
2. **ConnectionStrings**:
   * **HangfireConnection**: Connection string for the Hangfire database.
   * **IFASConnection**: Connection string for the main application database.
3. **MicroserviceApi**:
   * BaseUrl: Base URL for the microservice API.
4. **MSSettings**:
   * CompanyId: Identifier for the company.
   * BatchSize: Number of records to process in each batch.
   * ExportIntervalInMinutes: Interval for export operations.
   * ExportHandshakeIntervalInMinutes: Interval for handshake operations.

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**How It Works**

1. **Startup**:
   * The Program.cs file configures the Worker Service and registers dependencies.
   * The Worker class starts running background tasks.
2. **Task Execution**:
   * The Worker periodically invokes the IFASMSJobService to perform tasks.
   * The IFASMSJobService interacts with the ExportService to export data in batches.
3. **Synchronization**:
   * The MSSynchronizationController provides endpoints for triggering synchronization tasks.
   * The ExportService ensures data consistency during synchronization.
4. **Configuration-Driven Behavior**:
   * The behavior of the service is driven by settings in appsettings.json, allowing for easy customization.

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**Dependencies**

1. **Hangfire**:
   * Used for scheduling and managing background tasks.
2. **HttpClient**:
   * Used for making API calls to external microservices.
3. **SQL Server**:
   * Used for storing application and Hangfire data.

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**Extensibility**

1. **Adding New Tasks**:
   * Implement new services inheriting from **BackgroundService** or integrate them into IFASMSJobService.
2. **Customizing Behavior**:
   * Update appsettings.json to modify settings like batch size or export intervals.
3. **API Enhancements**:
   * Add new endpoints to MSSynchronizationController for additional synchronization features.

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**Potential Improvements**

1. **Centralized Logging**:
   * Implement a centralized logging framework like Serilog for better observability.
2. **Health Checks**:
   * Add health checks to monitor the status of the Worker Service and its dependencies.
3. **Unit Tests**:
   * Ensure comprehensive unit tests for all services and controllers.

**Conclusion**

This solution is a robust implementation of a .NET Worker Service with support for background tasks, synchronization, and data export. It is highly configurable and extensible, making it suitable for a wide range of use cases. By addressing the suggested improvements, the solution can be further enhanced for scalability, reliability, and maintainability.