Purpose and Product Overview
The product is a cloud-based job management system which will be available through a web interface. It functions as a tool for securely aiding and automating job scheduling to efficiently allocate resources by making predictions based on real-time data in order to avoid job execution failures.

The system is designed as a collection of microservices that includes five basic services: real-time data management service, prediction service, job scheduling service, system monitor service, and database access service.
System Overview

Requested Job
A requested job is entered by user and includes a set of resources and a time frame to complete a job.

Scheduled Job
A scheduled job has an expected start time, an expected end time and allocated resources. When all of a Requested Job's resources are available, it can be scheduled. The allocated resources will be marked busy at the scheduled timeframe.

Definitions
**Resource**
Each resource maintains a set of attributes that reflect its state during a set of time frames. These attributes will be used to determine whether they are available to perform a certain job at a certain time.

**Prediction**
A prediction is a set of attributes that defines the state of a resource object at a given time frame, with a confidence level.

**User triggered event**
A user-triggered event is a change of resource state or job state requested by the user, it can include but is not limited to: addition of a resource, job delay, job cancellation, job priority change, etc.

**Real-time data**
Real-time data is time series data input from field sensors. Different types of data can have different forms. These data includes but is not limited to: wind speed, temperature, atmospheric pressure, NWS warnings, etc.

**Core Services**

**Real-time Data Management Service**

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[Diagram of data management and job scheduling services]

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*User* → *Admin (super user)* → *View* → *Create* → *Edit* → *Delete* → *Audit* → *Bounce if no permission* → *Forward if user has permission* → *Data Management Layer* → *Job Scheduling Layer*
The real-time data management service hosts an endpoint that accepts data from client applications, and stores raw data for up to 5 years. It allows subscription to incoming new data through customized filter.

**Prediction service**

The prediction service hosts all prediction engines, and is redeployable for if the prediction algorithm needs to be changed. The prediction engine subscribes to the real-time data management service through a customized filter, and produces predictions based on selected data input. Prediction results is maintained within the service, and it allows subscription to updated prediction results through customized filter.
The scheduler resolves dependencies between resources according to prediction results and produces a recommended schedule (update) for a job in response to a request. Users can accept, reject, or edit this recommended schedule.
System monitor service

The system monitor services hosts all the user views. The user view access will be managed by permission, and a user’s access authentication should be set by the administrator.

1. **User Authentication view**
   The user authentication view is visible to all users. It allows user login and user registration.

2. **Resource management view**
   The resource management view allows an authorized user to view/create/edit/delete resources.

3. **Job creation and scheduling view**
   Allows authorized user to view/create/edit/delete a requested job.

4. **Job monitoring view**
   Allows user to view a scheduled job, suggested changes for the schedule, and the job progress.

5. **Real-time data source management view**
   Allows authorized user to view/create/edit/delete a data source, including a source for sensor data and publicly available data.

6. **System administrator view**
   The system administrator will be able to sort/search user using customized filter. They will be able to modify user permissions.

7. **System audit view**
   The auditor can query systems logs for up to five years including but not limited to: raw data, prediction results, jobs schedules, user history, etc.
**Database access service**

The database access service hosts all access to the common databases, such as the ones for requested jobs, scheduled jobs, users, and resources.