Formal Specification for the Asynchronous Text Analysis System - Language Model

1. System Aggregates and Connections

Aggregates:

- an_1 = Client
- an_2 = WebAPI
- an_3 = AzureAI_Language

Connections:

- Connection(Client, WebAPI)
- Connection(WebAPI, AzureAI_Language)

2. Predicates

- InputSignal(an_i, signal_name, $param_1$, ...): *Represents an incoming signal to an aggregate.*
- OutputSignal(an_i, signal_name, $param_1$, ...): *Represents an outgoing signal from an aggregate.*
- State(an_i, job_id, text, type, status, result): *Represents the state of a job within an aggregate.*
- InternalEvent(an_i, event_name, $param_1$, ...): *Represents an event happening within an aggregate.*

3. Production Rules

Rule 1: Job Submission (Client Request Arrives at WebAPI)

- **IF:**
  - InputSignal(WebAPI, ANALYZE_REQ, text, analysisType, reqNo)
- **THEN:**
  - State(WebAPI, new_job_id*, text, analysisType, "Queued", null)
  - OutputSignal(WebAPI, JOB_ACCEPTED, reqNo, new_job_id*)

Rule 2: Job Processing Begins (Background Worker Dequeues Job)

- **IF:**
  - State(WebAPI, job_id, text, analysisType, "Queued", null)
  - Aux(WorkerIsIdle = True)
- **THEN:**
  - State(WebAPI, job_id, text, analysisType, "Processing"*, null)
  - InternalEvent(WebAPI, START_AZURE_CALL, job_id, text, analysisType)

Rule 3: WebAPI Calls External Azure Service

- **IF:**
  - InternalEvent(WebAPI, START_AZURE_CALL, job_id, text, analysisType)
- **THEN:**
  - OutputSignal(WebAPI, AZURE_REQUEST, job_id, text, analysisType)

Rule 4: Successful Response from Azure

- **IF:**
  - State(WebAPI, job_id, text, analysisType, "Processing", null)
  - InputSignal(WebAPI, AZURE_RESPONSE, job_id, analysisResult, wasSuccessful)
  - Aux(wasSuccessful = True)
- **THEN:**
  - State(WebAPI, job_id, text, analysisType, "Completed"*, analysisResult*)

Rule 5: Failed Response from Azure

- **IF:**
  - State(WebAPI, job_id, text, analysisType, "Processing", null)
  - InputSignal(WebAPI, AZURE_RESPONSE, job_id, errorReason, wasSuccessful)
  - Aux(wasSuccessful = False)
- **THEN:**
  - State(WebAPI, job_id, text, analysisType, "Failed"*, errorReason*)

Rule 6: Client Polls for Status

- **IF:**
  - InputSignal(WebAPI, GET_STATUS, reqNo, job_id)
  - State(WebAPI, job_id, text, analysisType, currentStatus, currentResult)
- **THEN:**
  - OutputSignal(WebAPI, STATUS_UPDATE, reqNo, job_id, currentStatus, currentResult)