Message Queue Architecture Design

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Summit Digital Solutions, Inc.

Version 1.4

Last Updated: January 9, 2024

1. OVERVIEW AND PURPOSE

1. This Message Queue Architecture Design document ("Architecture Design") sets forth the technical and operational specifications for the message queue infrastructure implemented within Summit Digital Solutions, Inc.'s ("Company") Peak Performance Platform(TM) and related enterprise systems.

2. This document is considered confidential and proprietary information of the Company and is subject to the terms of the Company's Master Confidentiality Agreement.

2. DEFINITIONS

1. "Message Queue System" means the distributed message broker infrastructure that facilitates asynchronous communication between microservices within the Peak Performance Platform(TM).

2. "Producer Services" means any Company software component that generates and publishes messages to the Message Queue System.

3. "Consumer Services" means any Company software component that subscribes to and processes messages from the Message Queue System.

4. "Message Schema" means the standardized data structure and format specifications for messages transmitted through the Message Queue System.

3. ARCHITECTURE SPECIFICATIONS

1. Core Infrastructure

- Primary Message Broker: Apache Kafka v2.8.1
- Secondary Message Broker: RabbitMQ v3.9.13 (failover)
- Cluster Configuration: Minimum 3 nodes per environment

- Data Center Distribution: Active-active across US-East and US-West

2. Performance Requirements

- Minimum Throughput: 10,000 messages per second
- Maximum Latency: 50 milliseconds
- Message Persistence: 7 days
- Maximum Message Size: 1MB

3. Security Controls

- Transport Layer Security (TLS) 1.3
- SASL/SCRAM authentication
- Role-based access control (RBAC)
- Message-level encryption for sensitive data

4. MESSAGE HANDLING PROTOCOLS

1. Message Format Standards

- JSON message envelope
- Protocol Buffers for payload serialization
- Required metadata headers:
- message_id: UUID
- timestamp: ISO 8601
- origin_service: string
- correlation_id: UUID

2. Queue Management

- Dead letter queue implementation required
- Automatic message expiration after 72 hours
- Retry policy: 3 attempts with exponential backoff
- Circuit breaker pattern implementation

5. OPERATIONAL REQUIREMENTS

1. Monitoring and Alerting

- Real-time metrics collection via Prometheus
- Grafana dashboards for visualization
- Alert thresholds:
- Queue depth > 1000 messages
- Consumer lag > 60 seconds
- Error rate > 1%

2. Disaster Recovery

- Recovery Point Objective (RPO): 5 minutes
- Recovery Time Objective (RTO): 30 minutes
- Automated failover between data centers
- Daily backup of broker configuration

6. COMPLIANCE AND AUDIT

1. Logging Requirements

- Message metadata logging
- Access control events
- System health metrics
- Retention period: 90 days

2. Audit Trail

- Message tracking capability
- Producer/consumer activity logs
- Configuration change history
- Security event logging

7. IMPLEMENTATION GUIDELINES

1. Development Standards

- Message queue client libraries must be Company-approved
- Integration testing required for all new queue implementations
- Performance testing requirements defined in QA-STD-001
- Code review mandatory for queue-related changes

2. Documentation Requirements

- API documentation for all queue interfaces
- Runbook for operational procedures
- Disaster recovery playbooks
- Configuration management documentation

8. PROPRIETARY RIGHTS

1. All aspects of this Architecture Design, including but not limited to the technical specifications, configurations, and implementation details, are the exclusive property of Summit Digital Solutions, Inc.

2. No part of this Architecture Design may be reproduced, modified, or distributed without the express written consent of the Company's Chief Technology Officer.

9. APPROVAL AND GOVERNANCE

This Architecture Design has been reviewed and approved by:

/s/ Michael Chang

Michael Chang

Chief Technology Officer

Date: January 9, 2024

/s/ James Henderson

James Henderson

Chief Digital Officer

Date: January 9, 2024

10. REVISION HISTORY

Version 1.4 - January 9, 2024

- Updated security protocols
- Added failover broker configuration
- Enhanced monitoring requirements

Version 1.3 - October 15, 2023

- Updated performance requirements
- Added compliance section

Version 1.2 - July 1, 2023

- Initial production release