

**GALAXIUM**  
TRAVELS

# Galaxium Travels - IT System Architecture

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**Prepared by:** IT Architecture Team  
**Approved by:** Dr. Sarah Quantum, CTO

## Executive Summary

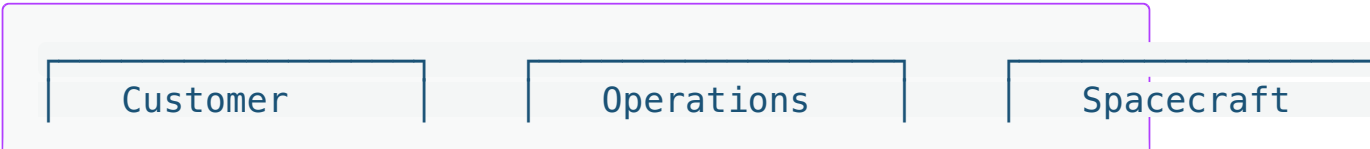
This document outlines the comprehensive IT system architecture supporting Galaxium Travels' luxury space tourism operations. Our architecture prioritizes safety, reliability, and scalability while maintaining the highest standards of customer service and operational excellence.

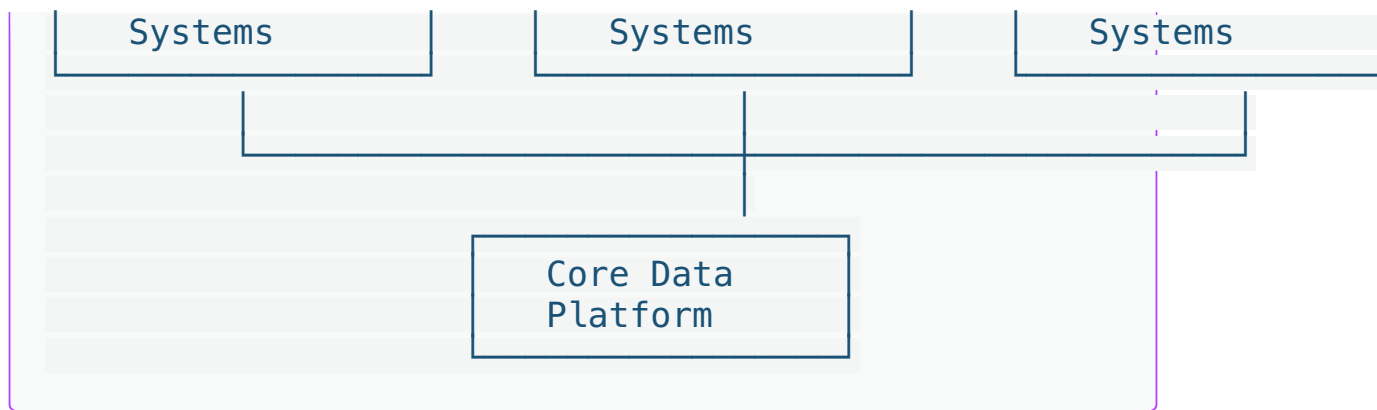
## System Overview

### Core Principles

- **Safety First:** All systems designed with redundancy and fail-safe mechanisms
- **Real-time Operations:** Mission-critical systems operate in real-time
- **Scalability:** Architecture supports 300% growth over next 5 years
- **Security:** Multi-layered security approach protecting customer and operational data
- **Reliability:** 99.99% uptime requirement for critical systems

### High-Level Architecture





## Core Systems

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### 1. Mission Control System (MCS)

**Purpose:** Real-time spacecraft monitoring and control

**Criticality:** Mission Critical

**Uptime Requirement:** 99.999%

#### Components

- **Flight Tracking Module**

- Real-time telemetry processing
- Orbital mechanics calculations
- Trajectory monitoring and prediction
- Automated anomaly detection

- **Life Support Monitoring**

- Atmospheric composition tracking
- Temperature and pressure monitoring
- Emergency alert systems
- Automated life support adjustments

- **Communication Hub**

- Spacecraft-to-ground communications
- Emergency communication protocols
- Video/audio streaming capabilities
- Data transmission optimization

#### Technical Specifications

- **Platform:** Custom real-time operating system

- **Hardware:** Redundant server clusters with hot failover
- **Data Processing:** 10,000+ telemetry points per second
- **Response Time:** <100ms for critical alerts
- **Backup Systems:** Triple redundancy with automatic failover

## 2. Customer Experience Platform (CEP)

**Purpose:** End-to-end customer journey management

**Criticality:** Business Critical

**Uptime Requirement:** 99.9%

### Customer Portal

- **Booking System**

- Real-time availability checking
- Dynamic pricing engine
- Payment processing integration
- Document management

- **Pre-Flight Management**

- Training schedule coordination
- Medical clearance tracking
- Travel arrangement integration
- Custom experience planning

- **Experience Delivery**

- In-flight entertainment system
- Real-time family communication
- Photo/video capture and delivery
- Personalized service requests

### Technical Specifications

- **Frontend:** React.js with TypeScript
- **Backend:** Node.js microservices architecture
- **Database:** PostgreSQL with Redis caching
- **CDN:** Global content delivery network
- **Mobile:** Native iOS and Android applications

### 3. Safety Management System (SMS)

**Purpose:** Comprehensive safety monitoring and compliance

**Criticality:** Mission Critical

**Uptime Requirement:** 99.999%

#### Safety Modules

- **Risk Assessment Engine**

- Real-time risk calculation
- Predictive safety analytics
- Automated safety recommendations
- Compliance monitoring

- **Incident Management**

- Automated incident detection
- Emergency response coordination
- Investigation workflow management
- Regulatory reporting automation

- **Training Management**

- Employee certification tracking
- Training schedule optimization
- Competency assessment
- Compliance verification

#### Technical Specifications

- **Platform:** Java Spring Boot microservices
- **Database:** PostgreSQL with time-series data storage
- **Analytics:** Apache Kafka + Apache Spark
- **Machine Learning:** TensorFlow for predictive analytics
- **Integration:** RESTful APIs with spacecraft systems

### 4. Enterprise Resource Planning (ERP)

**Purpose:** Business operations management

**Criticality:** Business Critical

**Uptime Requirement:** 99.5%

## Core Modules

- **Financial Management**

- Revenue recognition
- Cost accounting
- Budget tracking
- Financial reporting

- **Human Resources**

- Employee lifecycle management
- Payroll processing
- Performance management
- Compliance tracking

- **Supply Chain Management**

- Inventory management
- Vendor management
- Procurement automation
- Quality assurance

## Technical Specifications

- **Platform:** SAP S/4HANA Cloud
- **Integration:** SAP Cloud Platform Integration
- **Analytics:** SAP Analytics Cloud
- **Mobile:** SAP Fiori applications
- **Customization:** ABAP and JavaScript

## Data Architecture

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### Data Lake

**Purpose:** Centralized data storage and analytics

**Technology:** Amazon S3 with AWS Lake Formation

### Data Categories

- **Operational Data**

- Flight telemetry
- Customer interactions
- Financial transactions
- Safety incidents

- **Analytics Data**

- Customer behavior patterns
- Operational efficiency metrics
- Predictive maintenance data
- Market intelligence

## Data Warehouse

**Purpose:** Structured data for reporting and analytics

**Technology:** Amazon Redshift

## Data Marts

- **Customer Analytics**
- **Operational Performance**
- **Financial Reporting**
- **Safety Metrics**

## Real-time Streaming

**Purpose:** Real-time data processing

**Technology:** Apache Kafka + Apache Storm

## Stream Processing

- **Telemetry Processing:** Real-time spacecraft data analysis
- **Customer Events:** Real-time customer interaction tracking
- **Safety Monitoring:** Continuous safety parameter analysis
- **Operational Metrics:** Real-time operational performance tracking

# Security Architecture

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## Security Layers

### 1. Network Security

- Firewall protection
- VPN access
- Network segmentation
- Intrusion detection

## 2. Application Security

- Multi-factor authentication
- Role-based access control
- API security
- Code scanning

## 3. Data Security

- Encryption at rest
- Encryption in transit
- Data loss prevention
- Backup encryption

## 4. Physical Security

- Biometric access control
- 24/7 monitoring
- Secure data centers
- Environmental controls

## Compliance Standards

- **SOC 2 Type II:** Security and availability controls
- **ISO 27001:** Information security management
- **GDPR:** Data protection compliance
- **FAA Regulations:** Aviation security requirements

## Infrastructure

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### Cloud Platform

**Primary:** Amazon Web Services (AWS)

**Secondary:** Microsoft Azure (disaster recovery)

### AWS Services

- **Compute:** EC2, ECS, Lambda
- **Storage:** S3, EBS, EFS
- **Database:** RDS, DynamoDB, ElastiCache
- **Analytics:** Redshift, EMR, Kinesis
- **Security:** IAM, KMS, CloudTrail
- **Monitoring:** CloudWatch, X-Ray



## On-Premises Infrastructure

**Purpose:** Mission-critical systems requiring local control

### Components

- **Mission Control Center**

- Redundant server clusters
- High-speed networking
- Uninterruptible power supply
- Environmental monitoring

- **Spaceport Operations**

- Local data processing
- Communication systems
- Safety monitoring
- Backup systems

## Network Architecture

- **Primary Connection:** Dedicated fiber optic lines
- **Backup Connection:** Satellite communication
- **Internal Network:** 10 Gbps backbone
- **Wireless:** Wi-Fi 6 throughout facilities
- **Redundancy:** Multiple ISP connections

## Monitoring and Observability

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### Application Performance Monitoring

**Tool:** New Relic

**Coverage:** All customer-facing applications

### Infrastructure Monitoring

**Tool:** Datadog

**Coverage:** All servers, databases, and network devices

## Log Management

**Tool:** Splunk

**Coverage:** All applications and infrastructure components

## Alerting

- **Critical Alerts:** Immediate notification to on-call team
- **Warning Alerts:** Notification within 15 minutes
- **Info Alerts:** Daily summary reports

## Disaster Recovery

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### Recovery Objectives

- **Recovery Time Objective (RTO):** 4 hours for critical systems
- **Recovery Point Objective (RPO):** 15 minutes for critical data
- **Business Continuity:** 99.9% availability target

### Backup Strategy

- **Real-time Replication:** Critical operational data
- **Daily Backups:** All business data
- **Weekly Backups:** Full system images
- **Monthly Backups:** Long-term archival

### Disaster Recovery Sites

- **Primary Site:** Spaceport Alpha, Mojave Desert, CA
- **Secondary Site:** AWS US-West-2 (Oregon)
- **Tertiary Site:** Azure East US (Virginia)

## Future Roadmap

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### 2025 Initiatives

- **AI-Powered Predictive Maintenance**
- **Enhanced Customer Personalization**
- **Blockchain-based Identity Management**

- Edge Computing for Real-time Processing

## 2026-2027 Initiatives

- Quantum Computing Integration
- Advanced Machine Learning Models
- Autonomous System Management
- Next-Generation Communication Protocols

## Governance

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### Architecture Review Board

- **Chair:** Dr. Sarah Quantum, CTO
- **Members:** IT Directors, Security Officer, Operations Manager
- **Meeting Frequency:** Monthly
- **Responsibilities:** Architecture decisions, technology standards, security policies

### Change Management

- **Process:** ITIL-based change management
  - **Approval:** Architecture Review Board for major changes
  - **Testing:** Comprehensive testing in staging environment
  - **Deployment:** Automated deployment with rollback capabilities
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### Document Control

**Classification:** Internal Use Only

**Next Review Date:** July 1, 2025

**Distribution:** IT Leadership, Operations Management, Security Team