CSC 431 – Spring 2025

AGN-DB Website Improvement Project

Software Requirements Specification (SRS)

Ethan Lichtblau	Team Member
Carlos Rodriguez	Team Member
Zain Khalid	Team Member
Sebastian Gonzales-Portillo	Team Member

Version History

Version	Date	Author(s)	Change Comments
1.0	2/23	Ethan Lichtblau Zain Khalid Carlos Rodriguez Sebastian Gon...	Initial creation: Defined system requirements, functional and non-functional requirements Added database admin requirements and associated non-functional requirements Created comprehensive system constraints across all categories Added MySQL/MariaDB specific constraints and considerations Added evolutionary requirements for future integrations:
2.0	2/24	Ethan Lichtblau Zain Khalid Carlos Rodriguez Sebastian Gon...	Updated page numbers in Table of Contents. Added Table of Figures names and page numbers. Added Figure 2.
3.0	2/24	Ethan Lichtblau Zain Khalid Carlos Rodriguez Sebastian Gon...	Deleted unnecessary template aspects. Fixed use-case diagrams.

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1. System Requirements

1.1 Functional Requirements

1.1.1 Query Interface Implementation

Title	AGN Data Query Interface
Description	Users must be able to query the AGN database through a web interface to search and filter astronomical data
Priority	0
Precondition(s)	User accesses website, database connection is active
Basic Flow	1. User accesses query interface 2. System presents query parameters 3. User inputs search criteria 4. System validates input 5. System executes query against MariaDB 6. System returns matching results
Postconditions(s)	Query results displayed to user
Use Case Diagram	Figure 1

1.1.2 Data Download Functionality

Title	Research Data Export
Description	System must allow users to download query results in appropriate formats for research purposes
Priority	1
Precondition(s)	User has executed a successful query
Basic Flow	1. User selects download option 2. System prepares data export 3. System validates data integrity 4. System generates downloadable file 5. User receives download
Postconditions(s)	User obtains requested dataset
Use Case Diagram	Figure 1

1.1.3 Navigation System

Title	Intuitive Navigation System
Description	Users must be able to efficiently navigate through different sections of the AGN-DB website using a clear and consistent navigation structure
Priority	1
Precondition(s)	User accesses website frontend
Basic Flow	1. User accesses main navigation menu 2. System displays available sections (Query, Results, Downloads, Documentation)

	3. User selects desired section 4. System validates user access permissions 5. System loads appropriate component 6. System maintains consistent navigation state
Postconditions(s)	User arrives at desired section with all relevant components loaded
Use Case Diagram	Figure 1

1.1.4 Database Maintenance Interface

Title	Database Administration Console
Description	System must provide administrators with a secure interface to manage and maintain the MariaDB database
Priority	0
Precondition(s)	Admin authentication, secure network connection to Maserati server
Basic Flow	1. Admin logs into secure administration interface 2. System validates admin credentials 3. System displays database status and management options 4. Admin selects maintenance task 5. System executes administrative function 6. System logs all administrative actions
Postconditions(s)	Maintenance action completed and logged
Use Case Diagram	Figure 1

1.1.5 Catalog Update System

Title	AGN Catalog Management
Description	System must allow administrators to update the AGN catalog with new astronomical data while maintaining data integrity
Priority	1
Precondition(s)	Admin authentication, validated data ready for import
Basic Flow	1. Admin initiates catalog update process 2. System validates update data format 3. System performs backup of current data 4. System executes update process 5. System verifies data integrity 6. System generates update report
Postconditions(s)	Catalog updated successfully with backup preserved
Use Case Diagram	Figure 1

1.1.6 System Monitoring Tools

Title	Performance Monitoring and Alerts
Description	System must provide tools for administrators to monitor system performance, resource usage, and receive alerts for potential issues
Priority	1
Precondition(s)	Monitoring system active
Basic Flow	1. System continuously monitors performance metrics 2. System analyzes metrics against thresholds 3. System generates alerts for anomalies 4. Admin receives notification of issues 5. System provides diagnostic information 6. Admin can access detailed logs and metrics
Postconditions(s)	System status monitored and issues identified (if any)
Use Case Diagram	Figure 1

1.2 Non-Functional Requirements

1.2.1 Database Performance

Title	Query Response Time
Description	The system must handle large dataset queries efficiently with minimal latency
Priority	1
Applicable FR(s)	AGN Data Query Interface, Research Data Export

1.2.2 Security Implementation

Title	SQL Injection Prevention
Description	System must implement security measures to prevent SQL injection attacks and unauthorized database access
Priority	1
Applicable FR(s)	AGN Data Query Interface

1.2.3 System Availability

Title	System Uptime and Reliability
Description	The AGN-DB system must maintain high availability to ensure consistent access for the astrophysics research community
Priority	1
Applicable FR(s)	AGN Data Query Interface, Research Data Export, Navigation System

1.2.4 Administrative Access Security

Title	Admin Authentication and Authorization
Description	System must implement robust authentication and authorization mechanisms for administrative access, including multi-factor authentication and role-based access control
Priority	0
Applicable FR(s)	Database Administration Console, AGN Catalog Management, Performance Monitoring and Alerts

1.2.5 System Logging and Audit

Title	Administrative Action Logging
Description	System must maintain comprehensive logs of all administrative actions, database changes, and system modifications for audit and accountability purposes
Priority	1
Applicable FR(s)	AGN Catalog Management, Database Administration Console

1.2.6 Backup and Recovery

Title	Data Backup and Recovery Processes
Description	System must maintain automated backup procedures and provide clear recovery processes to prevent data loss and ensure system restoration capabilities
Priority	0
Applicable FR(s)	Database Administration Console, AGN Catalog Management, Performance Monitoring and Alerts

1.2.7 Administrative Documentation

Title	System Administration Documentation
Description	Comprehensive documentation must be maintained for all administrative procedures, system configurations, and maintenance processes to ensure long-term maintainability
Priority	1
Applicable FR(s)	Database Administration Console, AGN Catalog Management, Performance Monitoring and Alerts

2. System Constraints

2.1 Tool Constraints

2.1.1 Development Tools

Title	Development Tools
Description	Project must use Docker for containerization and Git for version control to ensure deployment consistency and code management
Priority	1

2.2 Language Constraints

2.2.1 Frontend Framework (react.js)

Title	React.JS
Description	Frontend development must use React framework as per existing codebase
Priority	0

2.2.2 Backend Framework (express.js)

Title	Express.JS
Description	Backend must be developed using Express.js for middleware functionality
Priority	0

2.2.3 Query Standard

Title	SQL Query Standards
Description	All database queries must be written to be compatible with both MariaDB and MySQL standards to ensure long-term maintainability
Priority	1

2.3 Platform Constraints

2.3.1 Database Platform

Title	MariaDB
Description	System must utilize MariaDB as the database platform while ensuring MySQL compatibility, especially for: - Query optimization - Database connections - Data type handling - Stored procedures - Security implementations
Priority	0

2.4 Hardware Constraints

2.4.1 Server Infrastructure

Title	Maserati server
Description	System must operate on the existing Maserati server within the University of Miami's infrastructure
Priority	0

2.4.2 Resource Requirements

Title	Maserati System Requirements
Description	System must be optimized to handle large astronomical datasets within available server resources
Priority	1

2.5 Network Constraints

2.5.1 Network Integration

Title	ACoRN Network Integration
Description	System must be fully integrated with University of Miami's ACoRN network infrastructure
Priority	0

2.5.2 External Access

Title	Public Network Access
Description	System must be accessible through public network while maintaining security protocols
Priority	1

2.6 Deployment Constraints

2.6.1 Server Deployment

Title	Deployment
Description	System must be deployed on Maserati server with coordination from IT department (Cenkhan)
Priority	0

2.6.2 Docker Container Requirements

Title	Docker Deployment
Description	All system components must be properly containerized using Docker for consistent deployment
Priority	2

2.7 Transition & Support Constraints

2.7.1 Documentation Requirements

Title	Comprehensive Documentation
Description	Comprehensive documentation must be maintained for all system components to prevent future maintenance issues
Priority	1

2.7.2 Knowledge Transfer

Title	Knowledge Transfer to another team
Description	System must be designed and documented to allow for seamless transition between development teams
Priority	2

2.8 Budget & Schedule Constraints

2.8.1 Development Timeline

Title	Development timeline for AGN-DB Restoration
Description	Project must follow established milestone schedule: - Initial Assessment: 2 weeks - Frontend Restoration: 5-6 weeks - Backend Restoration: 5-6 weeks - Database Integration: 2-3 weeks - Deployment & Testing: 2 week
Priority	1

2.9 Miscellaneous Constraints

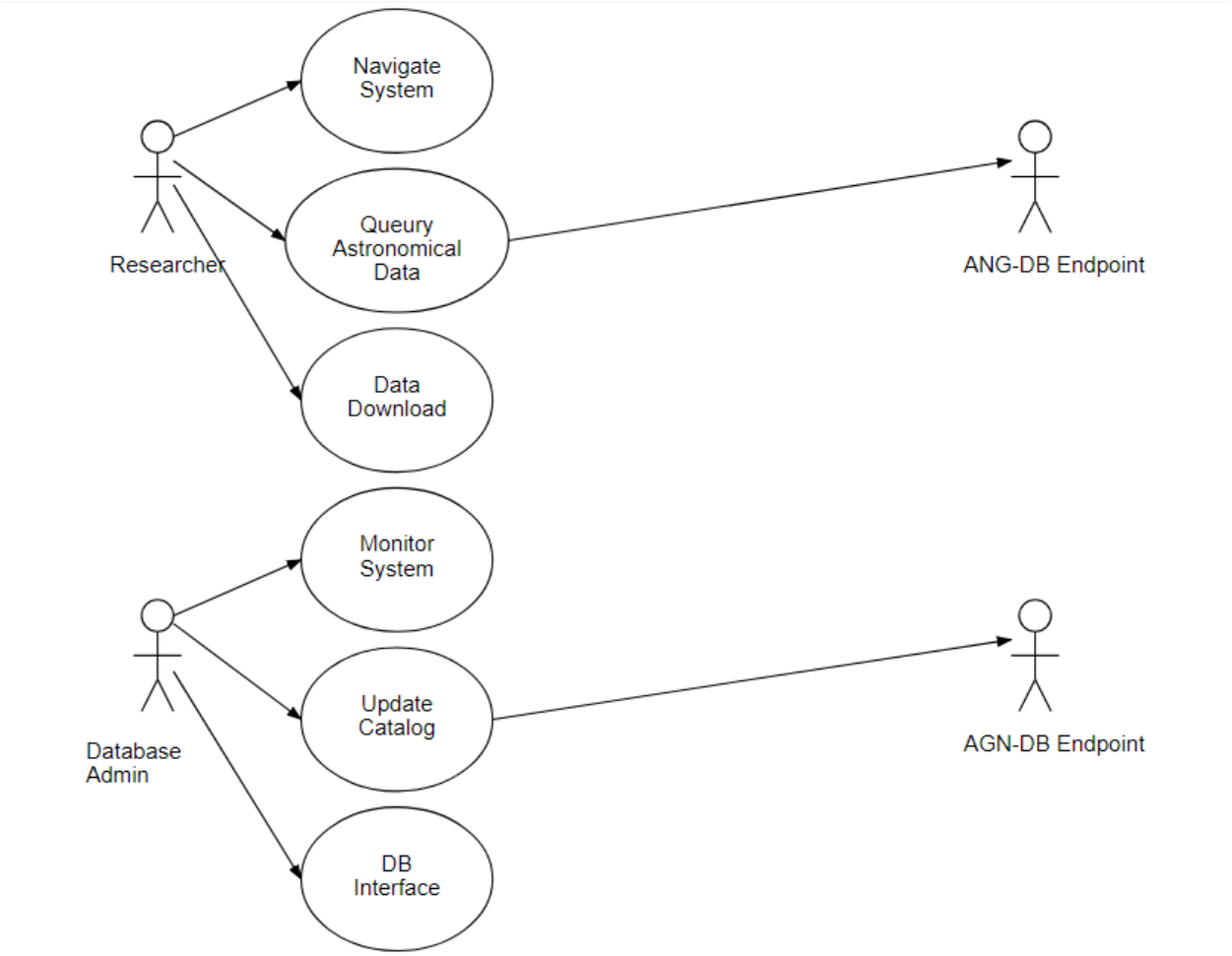
2.9.1 Research Community Standards

Title	Following Research Community Guidelines
Description	System must adhere to astrophysics community standards for data sharing and collaboration
Priority	2

3. Requirements Modeling

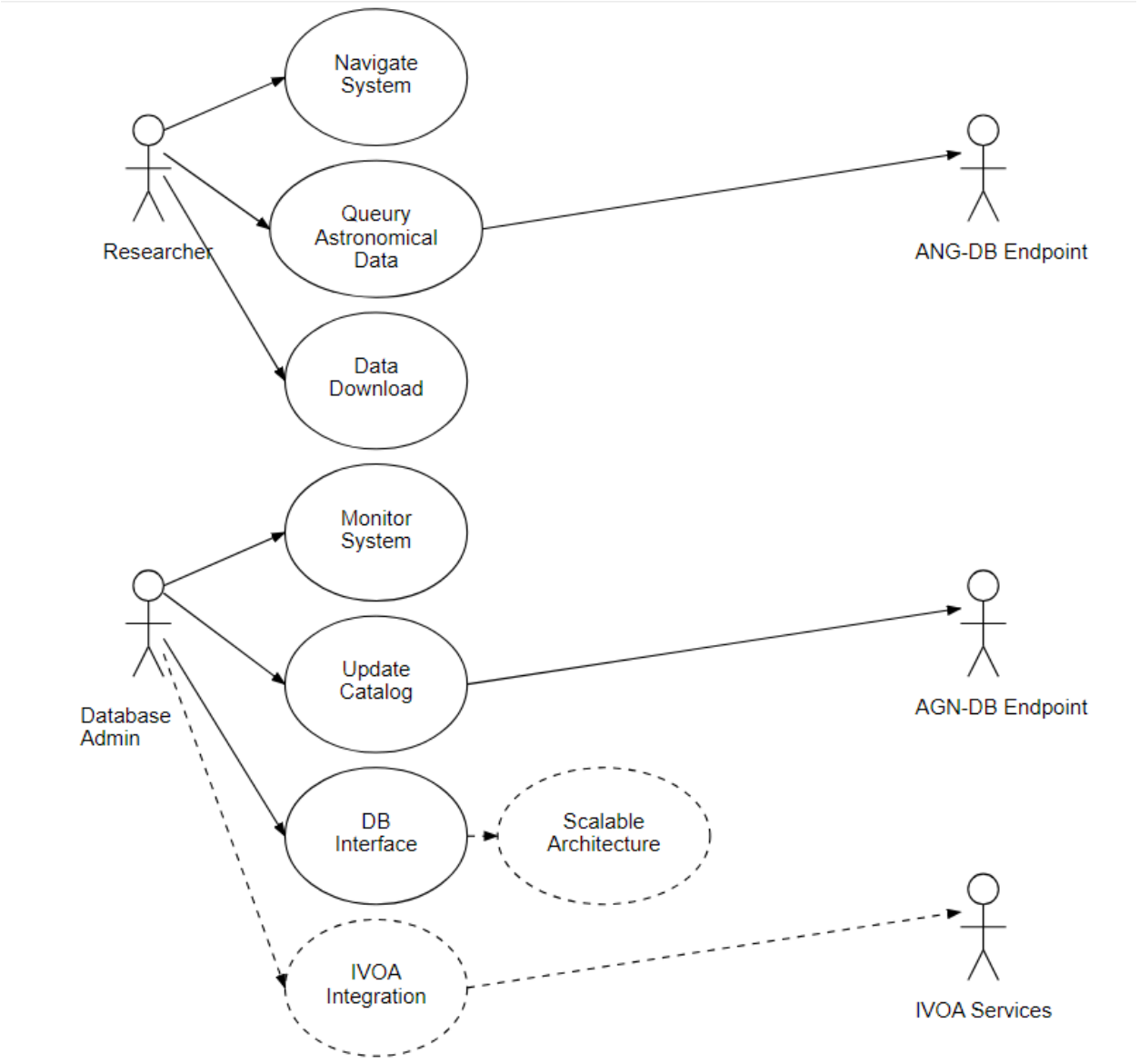
3.1 AGN-DB Use-case Diagram

Figure 1



3.2 AGN-DB Use-case Diagram with Evolutionary Requirements

Figure 2



4. Evolutionary Requirements

4.1 Functional Requirements

4.1.1 Virtual Observatory Integration

Title	IVOA Integration
Description	System must be prepared for future integration with the International Virtual Observatory Alliance (ivoa.net)
Priority	3
Precondition(s)	Basic AGN-DB system is operational
Postconditions(s)	System can interface with IVOA tools and services
Use Case Diagram	Figure 2

4.2 Non-Functional Requirements

4.2.1 Data Architecture

Title	Scalable Data Architecture
Description	Database structure must be designed to accommodate growing datasets and additional data types from future scientific missions
Priority	2
Applicable FR(s)	IVOA Integration, Data Management System