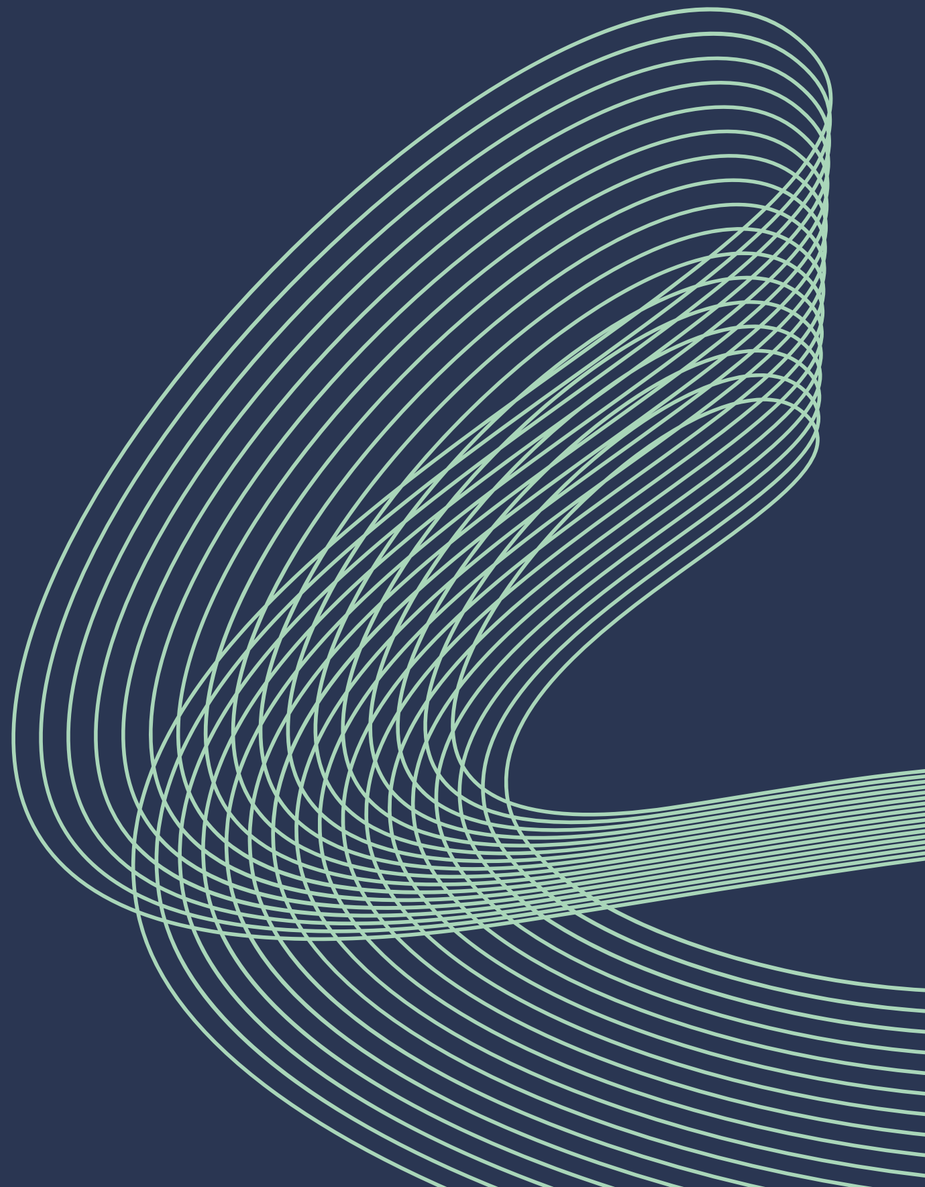
SOFTWARE ARCHITECTURE – COURSE PROJECT

BIZCO

Brokerage Information System (BIS)



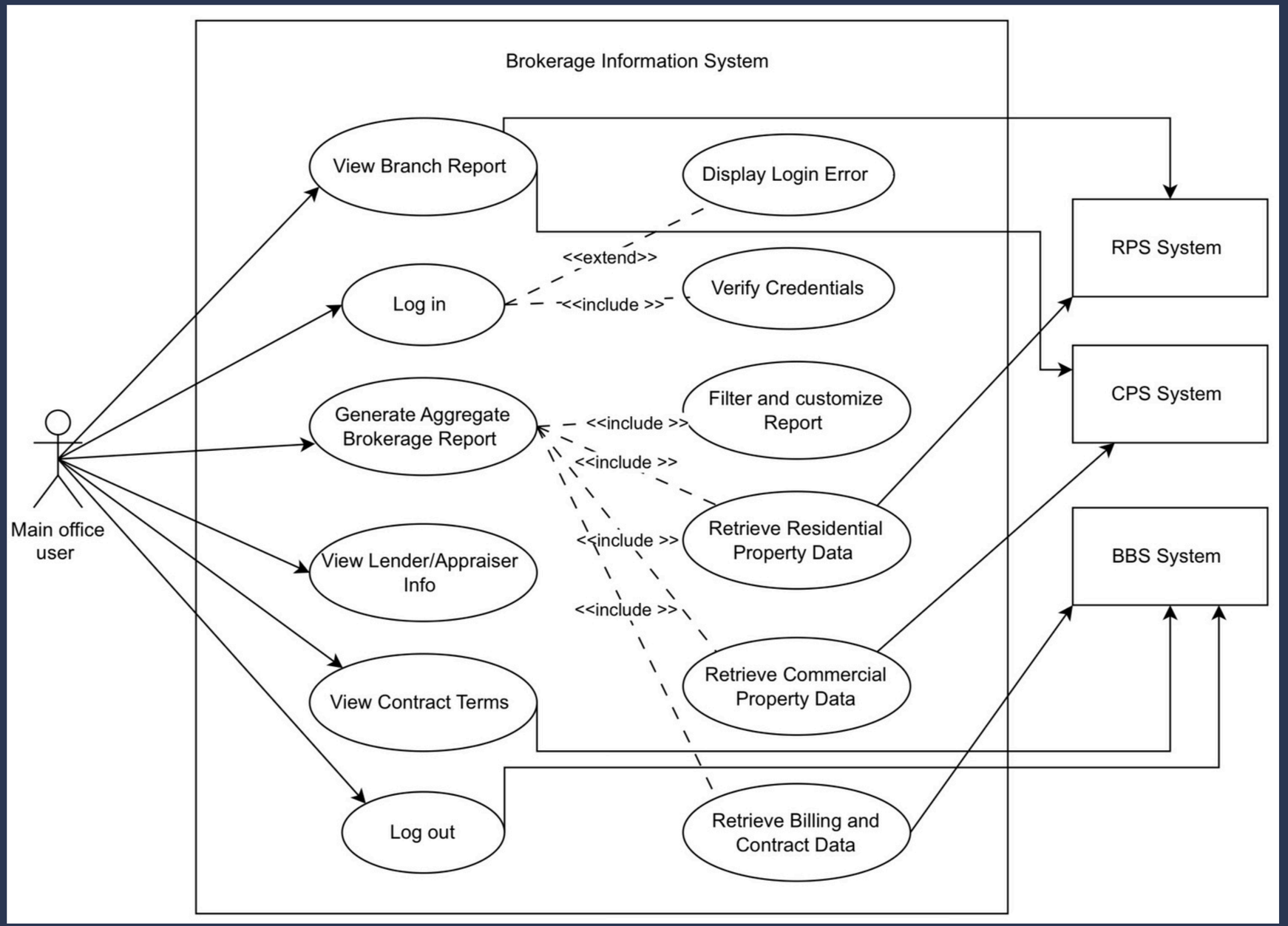
PRESENTED TO

DR. WED

INTRODUCTION

BizCo is a distributed brokerage company that requires a centralized system to aggregate data from multiple legacy systems. In this case study, we identified key quality attributes and ASRs, constructed a utility tree, and prioritized architectural concerns to guide the design of the BIS architecture.

USE CASE


Brokerage Information System
View Branch Report
Display Login Error
Log in
<<extend>>
<<include >>
Verify Credentials
Generate Aggregate Brokerage Report
<<include >>
Filter and customize Report
<<include >>
Retrieve Residential Property Data
<<include >>
View Lender/Appraiser Info
<<include >>
Retrieve Commercial Property Data
View Contract Terms
Log out
Retrieve Billing and Contract Data
Main office user
RPS System
CPS System
BBS System

Analysis of Use Cases

USE CASE 1: LOG IN

BG: ALLOWS USERS TO ACCESS THE BIS SYSTEM
CN: ONLY VALID REGISTERED USERS CAN LOG IN
UC 1 : THE SYSTEM SHALL ALLOW USERS TO LOG IN SECURELY

USE CASE 4: VIEW BRANCH REPORT

BG: ALLOWS REVIEWING BRANCH PERFORMANCE.
CN: ONLY AUTHORIZED USERS MAY ACCESS REPORTS.
UC 4 : THE SYSTEM SHALL ALLOW USERS TO VIEW BRANCH REPORTS

Analysis of Use Cases

USE CASE 7: GENERATE AGGREGATED BROKERAGE REPORT

BG: PRODUCES A COMBINED BROKERAGE REPORT.
CN: REQUIRES DATA FROM CPS, RPS, AND BBS.
UC 7 : THE SYSTEM SHALL GENERATE AGGREGATED BROKERAGE REPORTS

UTILITY TREE

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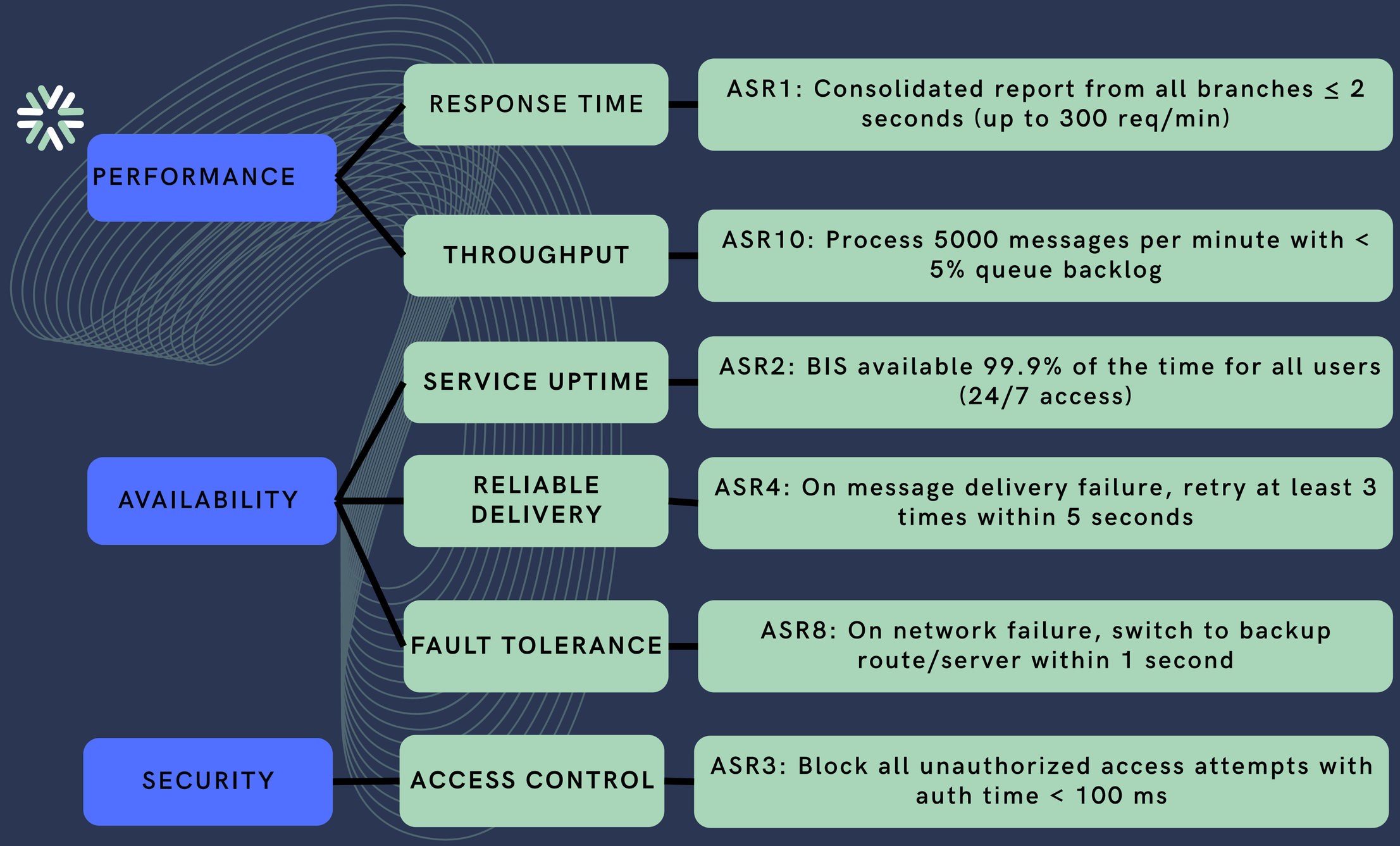
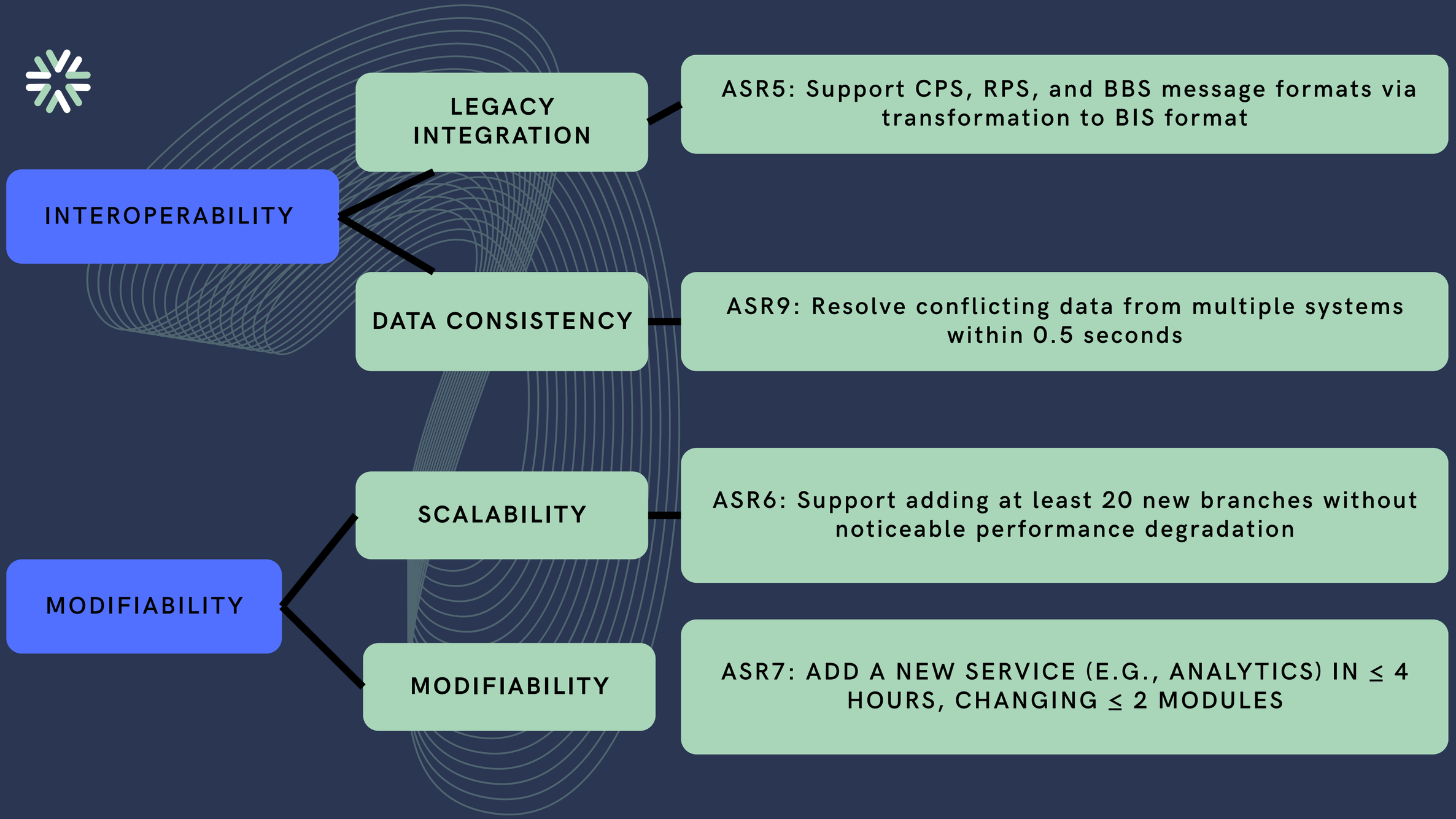

PERFORMANCE
RESPONSE TIME
ASR1: Consolidated report from all branches ≤ 2 seconds (up to 300 req/min)
THROUGHPUT
ASR10: Process 5000 messages per minute with < 5% queue backlog
AVAILABILITY
SERVICE UPTIME
ASR2: BIS available 99.9% of the time for all users (24/7 access)
RELIABLE DELIVERY
ASR4: On message delivery failure, retry at least 3 times within 5 seconds
FAULT TOLERANCE
ASR8: On network failure, switch to backup route/server within 1 second
SECURITY
ACCESS CONTROL
ASR3: Block all unauthorized access attempts with auth time < 100 ms


INTEROPERABILITY
LEGACY INTEGRATION
ASR5: Support CPS, RPS, and BBS message formats via transformation to BIS format
DATA CONSISTENCY
ASR9: Resolve conflicting data from multiple systems within 0.5 seconds
MODIFIABILITY
SCALABILITY
ASR6: Support adding at least 20 new branches without noticeable performance degradation
MODIFIABILITY
ASR7: ADD A NEW SERVICE (E.G., ANALYTICS) IN ≤ 4 HOURS, CHANGING ≤ 2 MODULES

Architecturally Significant Requirements (ASRs)

ASR1 (UC7 + CN): The system shall generate aggregated brokerage reports by retrieving data from CPS, RPS, and BBS within 2 seconds during peak usage to support timely decision-making.					
Quality Attribute	**ASR**	**Value**	**Value Justification**	**Impact**	**Impact Justification**
Performance	ASR1	H	Fast report generation is critical for management decision-making.	M	Requires optimized messaging and aggregation but no major architectural changes.

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Architecturally Significant Requirements (ASRs)

ASR3 (UC1 + UC2 + UC3 + CN): The system shall authenticate users securely and display generic error messages for invalid credentials to prevent unauthorized access and information leakage.					
Quality Attribute	**ASR**	**Value**	**Value Justification**	**Impact**	**Impact Justification**
Security	ASR3	H	Secure authentication is essential to prevent unauthorized system access.	M	Requires authentication and error-handling components.

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Prioritized Quality Attributes Table

Priority	Quality Attribute	Justification (method of prioritization)
1	Security	Protects sensitive brokerage and billing data
2	Performance	nables fast and timely decision-making
3	Availability / Reliability	Ensures continuous system operation

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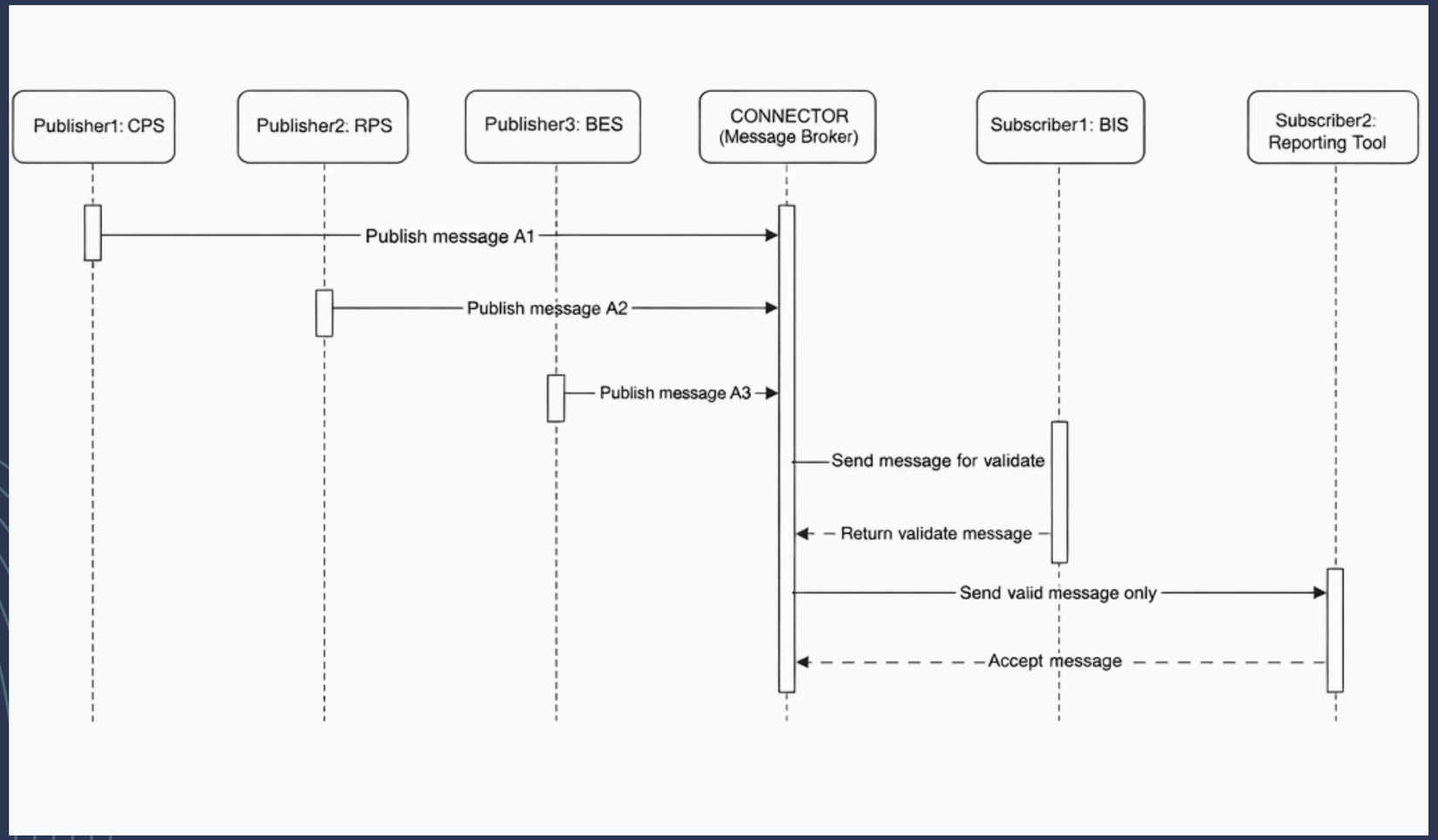
publisher-scriber pattern



publisher-scriber pattern

Pattern	Publisher–Subscriber Pattern
Overview	Enables asynchronous, event-driven communication between CPS, RPS, BBS, and the BIS without direct coupling between components.
Elements	Publishers, Subscribers, Message Broker, Event Topics/Channels
Relations	Publishers publish events → Message Broker distributes events → Subscribers receive relevant events only.
Constraints	All events must pass through the Message Broker; topics must be predefined; legacy systems must support event publishing
Tradeoffs	Pros: High scalability, loose coupling, real-time updates. Cons: Event filtering overhead, higher debugging complexity, topic management required.

Applying Architectural Tactics

Additional Quality Attribute: *Traceability*

- Traceability ensures requests and responses can be tracked end-to-end
- Critical for auditing, debugging, and compliance
- BIS integrates multiple legacy systems (CPS, RPS, BBS)

Modifiability Tactics and Trade-offs

Tactics:

- Maintain an audit trail for system actions
- Use correlation IDs and timestamps in messages
- End-to-end transaction monitoring

Trade-offs:

- Performance overhead from logging
- Increased architectural complexity
- Availability risk if centralized logging fails
- Security and privacy concerns

CONCLUSION

This case study presented the architectural design of the BizCo Brokerage Information System (BIS). Key ASRs were identified using a utility tree, with security and performance prioritized as the main architectural drivers. The resulting design supports secure access, fast report generation, and effective integration with legacy systems.

THANK YOU!

ANY QUESTIONS?

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