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BIZCO

PREPERED BY

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INSTRUCTOR

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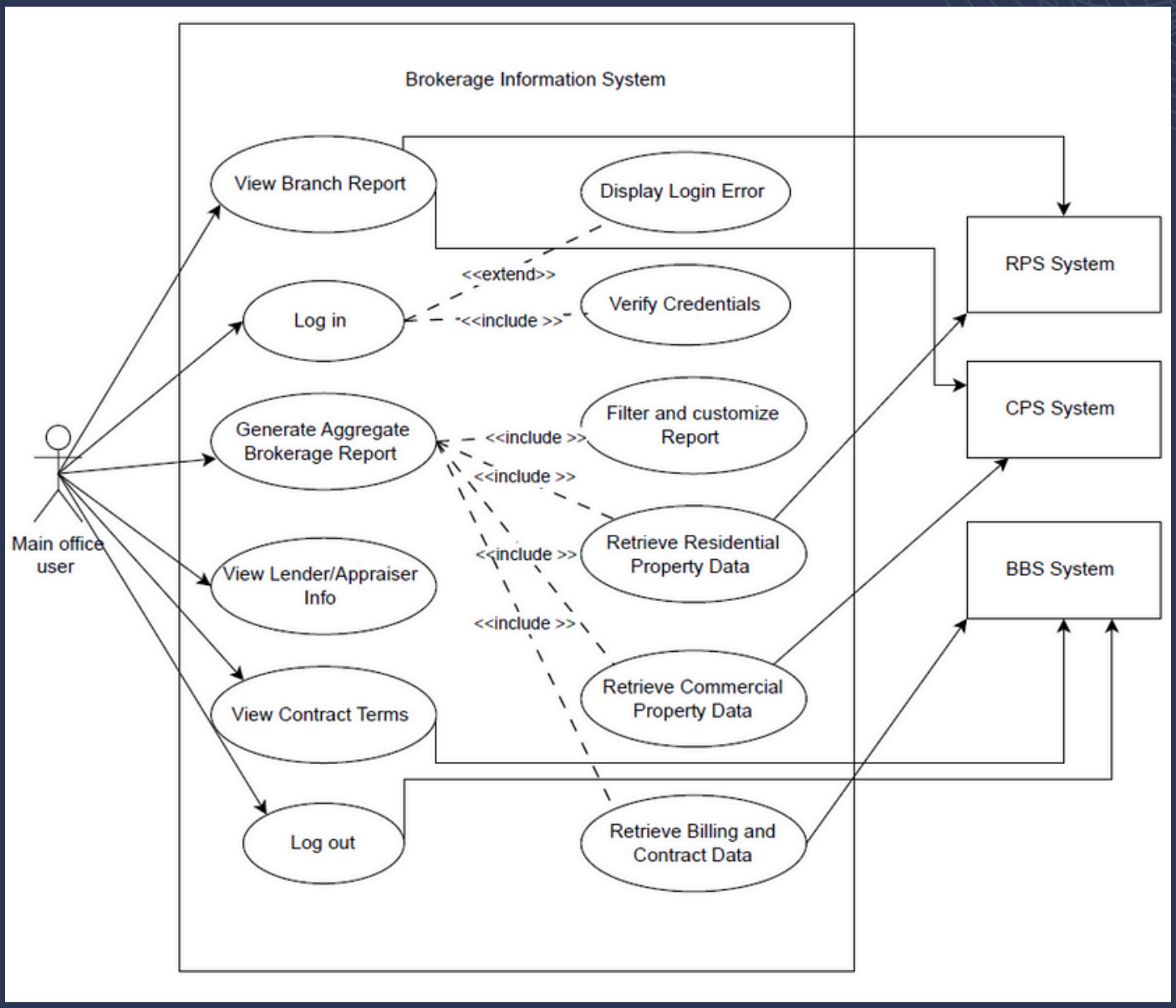
USE CASE


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

DESCRIPTION TABLE

uc1	User enters credentials to access the system
uc2	System checks username and password
uc3	System displays an error when credentials are invalid
uc4	System shows branch brokerage data.
uc5	System displays profiles and contacts.
uc6	System displays terms and conditions

DESCRIPTION TABLE

uc7	System generates an aggregated report
uc8	System collects commercial property records.
uc9	System collects residential property records
uc10	System collects billing and contract records
uc11	User applies filters to customize report output
uc12	User exits the 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 2: VERIFY CREDENTIALS (EXTEND)

BG: Ensures correct authentication.
CN: Must validate data securely.
UC 2 : The system shall verify login credentials

USE CASE 3: DISPLAY LOGIN ERROR (INCLUDE)

BG: Provides feedback for failed login.
CN: Error must not reveal sensitive info.
UC 3 : The system shall display a login error

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 5: VIEW LENDER/APPRAISER INFO

BG: Provides access to lender/appraiser data.
CN: Data must be retrieved from BBS only.
UC 5 : The system shall allow users to view lender/appraiser information

USE CASE 6: VIEW CONTRACT TERMS

BG: Allows users to review contract agreements.
CN: Only stored and approved contract data can be shown.
UC 6 : The system shall allow users to view contract terms

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

USE CASE 8: RETRIEVE COMMERCIAL PROPERTY DATA (INCLUDE)

BG: Retrieves commercial data for reporting.
CN: Must pull data from CPS only.
UC 8 : The system shall retrieve commercial property data

ANALYSIS OF USE CASES

USE CASE 9: RETRIEVE RESIDENTIAL PROPERTY DATA (INCLUDE)

BG: Retrieves residential data for reporting.
CN: Must pull data from RPS only.
UC 9: The system shall retrieve residential property data

USE CASE 10: RETRIEVE BILLING AND CONTRACT DATA (INCLUDE)

BG: Retrieves financial and contract information.
CN: Must use BBS data only.
UC 10 : The system shall retrieve billing and contract data

USE CASE 11: FILTER AND CUSTOMIZE REPORT (INCLUDE)

BG: Allows refining generated reports.
CN: Filters must not alter original data.
UC 11 : The system shall allow report filtering

USE CASE 12: LOG OUT

BG: Ends the user session.
CN: Must terminate access securely.
UC 12 : The system shall allow users to log out securely

TABLE 1: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR1 – PERFORMANCE)

ASR1 (UC7):The system shall generate aggregated brokerage reports within 2 seconds during peak usage.	
Origin	UC7 – Generate Aggregated Brokerage Report
Source	Main office user
Stimulus	User requests an aggregated brokerage report
Environment	Peak operational hours
Artifact	Business Logic layer and Messaging Infrastructure
Response	System collects data from CPS, RPS, and BBS and generates the report
Response Measure	Report generated in ≤ 2 seconds for up to 300 requests/min

TABLE 2: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR2 – SECURITY)

ASR2 (UC4 + CN):The system shall allow only authorized users to access branch reports.	
Origin	UC4 – View Branch Report + CN (only authorized users may access reports)
Source	Main office user
Stimulus	User attempts to view a branch report
Environment	Normal operation
Artifact	Access control component
Response	System verifies user authorization before displaying report
Response Measure	100% enforcement of authorization with 0 unauthorized accesses

TABLE 3: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR3 – SECURITY)

ASR3 (UC1 + UC2 + UC3 + CN):The system shall authenticate users securely and display generic error messages for invalid credentials.	
Origin	UC1 Log in + UC2 Verify Credentials + UC3 Display Login Error + CN
Source	User
Stimulus	User enters valid or invalid login credentials
Environment	Over network
Artifact	Authentication module and login interface
Response	System validates credentials and displays a non-sensitive error if invalid
Response Measure	Authentication completed in < 100 ms with 0 sensitive data leakage

TABLE 4: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR4 – INTEROPERABILITY)

ASR4 (UC8 + CN):The system shall retrieve commercial property data exclusively from the CPS system.	
Origin	UC8 – Retrieve Commercial Property Data + CN
Source	BIS reporting workflow
Stimulus	Request for commercial property data
Environment	Normal operation
Artifact	Messaging Infrastructure adapters
Response	System routes request only to CPS
Response Measure	100% correct routing with 0 incorrect system calls

TABLE 5: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR5 – INTEROPERABILITY)

ASR5 (UC9 + CN):The system shall retrieve residential property data exclusively from the RPS system.	
Origin	UC9 – Retrieve Residential Property Data + CN
Source	BIS reporting workflow
Stimulus	Request for residential property data
Environment	Normal operation
Artifact	Messaging Infrastructure adapters
Response	System routes request only to RPS
Response Measure	100% correct routing with 0 incorrect system calls

TABLE 6: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR6 – INTEROPERABILITY)

ASR6 (UC10 + CN): The system shall retrieve billing and contract data exclusively from the BBS system.	
Origin	UC10 – Retrieve Billing and Contract Data + CN
Source	BIS reporting workflow
Stimulus	Request for billing and contract data
Environment	Normal operation
Artifact	Messaging Infrastructure connectors
Response	System routes request only to BBS
Response Measure	100% correct routing with 0 incorrect system calls

TABLE 7: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR7 – AVAILABILITY AND RELIABILITY)

ASR7 (UC7): The system shall handle temporary unavailability of one data source during report generation.	
Origin	UC7 – Generate Aggregated Brokerage Report
Source	CPS, RPS, or BBS system
Stimulus	One data source becomes unavailable
Environment	Runtime during report generation
Artifact	Messaging Infrastructure and aggregation logic
Response	System retries and informs the user of unavailable data
Response Measure	At least 3 retries within 5 seconds before graceful failure

TABLE 8: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR8 – DATA INTEGRITY)

ASR8 (UC11 + CN): The system shall apply report filters without modifying the original aggregated data.	
Origin	UC11 – Filter and Customize Report + CN
Source	User
Stimulus	User applies filters to a generated report
Environment	Normal operation
Artifact	Filtering component
Response	System displays filtered view only
Response Measure	0 data modification incidents

TABLE 9: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR9 – DATA GOVERNANCE)

ASR9 (UC6 + CN) : The system shall display only stored and approved contract terms.	
Origin	UC6 – View Contract Terms + CN
Source	User
Stimulus	User requests contract terms
Environment	Normal operation
Artifact	Contract retrieval module
Response	System displays only approved contract data
Response Measure	100% compliance with approved data policy

TABLE 10: ARCHITECTURALLY SIGNIFICANT REQUIREMENT (ASR10 – SECURITY)

ASR10 (UC12 + CN): The system shall securely terminate user sessions upon logout.	
Origin	UC12 – Log out + CN
Source	User
Stimulus	User logs out
Environment	Normal operation
Artifact	Session and token management component
Response	System invalidates session and tokens
Response Measure	Report generated in ≤ 2 seconds for up to 300 requests/min

SYSTEM INTEGRATION

UTILITY TREE

- **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

UTILITY TREE – VALUE AND IMPACT ASSESSMENT

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.
Security	ASR2	H	Branch reports contain sensitive business data that must be protected.	L	Standard authorization mechanisms can be reused.
Security	ASR3	H	Secure authentication is essential to prevent unauthorized system access.	M	Requires authentication and error-handling components.
Interoperability	ASR4	H	Commercial data must be retrieved correctly to ensure accurate reporting.	M	Requires adapters and routing logic in the messaging layer.
Interoperability	ASR5	H	Residential data is essential for complete brokerage reports.	M	Similar integration effort as CPS with limited architectural impact.
Interoperability	ASR6	H	Billing and contract data is required for financial accuracy.	M	Requires reliable connectors to the BBS system.
Availability / Reliability	ASR7	H	Report generation must tolerate partial system failures to maintain usability.	H	Requires retry logic and fault-handling mechanisms.

UTILITY TREE – VALUE AND IMPACT ASSESSMENT

Quality Attribute	ASR	Value	Value Justification	Impact	Impact Justification
Data Integrity	ASR8	M	Filtering improves usability but does not affect core system functionality.	L	Implemented at the presentation/business logic level only.
Data Governance	ASR9	H	Displaying only approved contract data ensures legal and business compliance.	L	Simple validation against stored contract records.
Security	ASR10	H	Secure logout prevents unauthorized access after session termination.	L	Token/session invalidation is straightforward to implement.

PRIORITIZED QUALITY ATTRIBUTES TABLE

Priority	Quality Attribute	Justification (method of prioritization)
1	Security	Security is prioritized due to the sensitivity of brokerage, contract, and billing data, and multiple ASRs (ASR2, ASR3, ASR10) address access control and secure session handling.
2	Performance	Fast report generation is critical for timely decision-making, and several ASRs focus on response time and throughput (ASR1, ASR10).
3	Availability / Reliability	The system must remain operational despite partial failures to ensure continuous access to brokerage reports (ASR7).
4	Interoperability	BIS relies on integrating CPS, RPS, and BBS systems to function correctly, making interoperability essential (ASR4, ASR5, ASR6).

MESSAGING INFRASTRUCTURE DESIGN

SELECTED PATTERN: PUBLISHER-SUBSCRIBER PATTERN

- **Roles and Responsibilities**

1. Publishers (CPS, RPS, BBS): Generate and publish events such as new appraisal requests, completed appraisals, and billing updates

2. Message Broker: Receives published events, manages topics, and distributes events to the appropriate subscribers.

3. Subscribers (Business Logic Layer): Subscribe to relevant topics and process incoming events for report generation.

4. Event Topics/Channels: Logical channels for different event categories (e.g., CommercialRequests, ResidentialRequests, BillingUpdates).

- **Relationships and Interactions**

1. Publishers send events to the Message Broker.
2. The Message Broker routes events to the corresponding topics.
3. Subscribers receive only the events for the topics they are subscribed to.
4. Business Logic processes received events to update BIS reports.

- **Collaboration**

1. A system publishes an event.
2. The Message Broker routes the event to the correct topic.
3. Subscribers receive and process the event.
4. Business Logic updates aggregated data and reports in the BIS.

APPLYING TACTICS

SELECTING AN ADDITIONAL QUALITY ATTRIBUTE

Additional Quality Attribute: *Traceability*

Traceability is important for the BizCo BIS because the system handles critical business transactions involving property appraisals, billing, and reporting. BizCo must be able to trace each request and response across multiple legacy systems (CPS, RPS, and BBS) to support auditing, error diagnosis, and regulatory compliance. Improving traceability allows BizCo to understand how data flows through the system and to quickly identify the source of failures or inconsistencies.

ARCHITECTURAL TACTICS TO IMPROVE MODIFIABILITY

To enhance Traceability in the BIS, the following architectural tactics are applied:

1. Maintain an Audit Trail

- Each significant system action is logged, including requests, responses, and system decisions.
- This enables tracking of who performed an action, when it occurred, and which systems were involved.

2. Use Correlation IDs and Timestamps

- Every message exchanged between BIS and legacy systems includes a unique correlation ID and timestamp.
- This allows events across CPS, RPS, and BBS to be linked to a single transaction.

3. End-to-End Transaction Monitoring

- Monitoring tools track transactions from initiation to completion across all components.
- This supports rapid debugging and system analysis when failures occur.

TRADEOFFS OF THE SELECTED TACTICS

Applying traceability tactics introduces several tradeoffs that affect system behavior and design:

1. Performance Impact

- Issue: Logging and monitoring introduce additional processing overhead.
- Impact: System response time may increase slightly under heavy workloads.

2. Increased Architectural Complexity

- Issue: Audit logs, monitoring services, and correlation mechanisms add extra components.
- Impact: The system becomes more complex to configure and maintain.

3. Availability Risks

- Issue: Centralized logging or monitoring services may become single points of failure.
- Impact: If these services fail, traceability is lost and may affect system reliability.

4. Security and Privacy Concerns

- Issue: Logged data may contain sensitive information.
- Impact: Strong access control and data protection mechanisms are required.