

WIPRO NGA Program – 25SUB4508_LSP

Capstone Project Presentation – 13th Feb 2026

Project Title - Dynamic Connection Routing Management System

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Dynamic Connection Routing & Management System (DCRMS)

INTRODUCTION :

- The **Dynamic Connection Routing & Management System (DCRMS)** is a network orchestration framework designed to manage and redirect communication between multiple endpoint nodes.
- It uses a **Centralized Routing Engine (Server)** , **Distributed Client Node** Architecture along with an **Admin** who will supervise the overall system.
- The system maintains a **real-time node registry**, tracking availability and status of each endpoint.
- If a destination node is **busy or unavailable**, predefined **Redirection Protocols** dynamically reroute the session to an alternative node.
- The system ensures **secure authentication, persistent storage, and multi-level logging** for reliability and fault tolerance.

Dynamic Connection Routing & Management System (DCRMS)

PROBLEM STATEMENT:

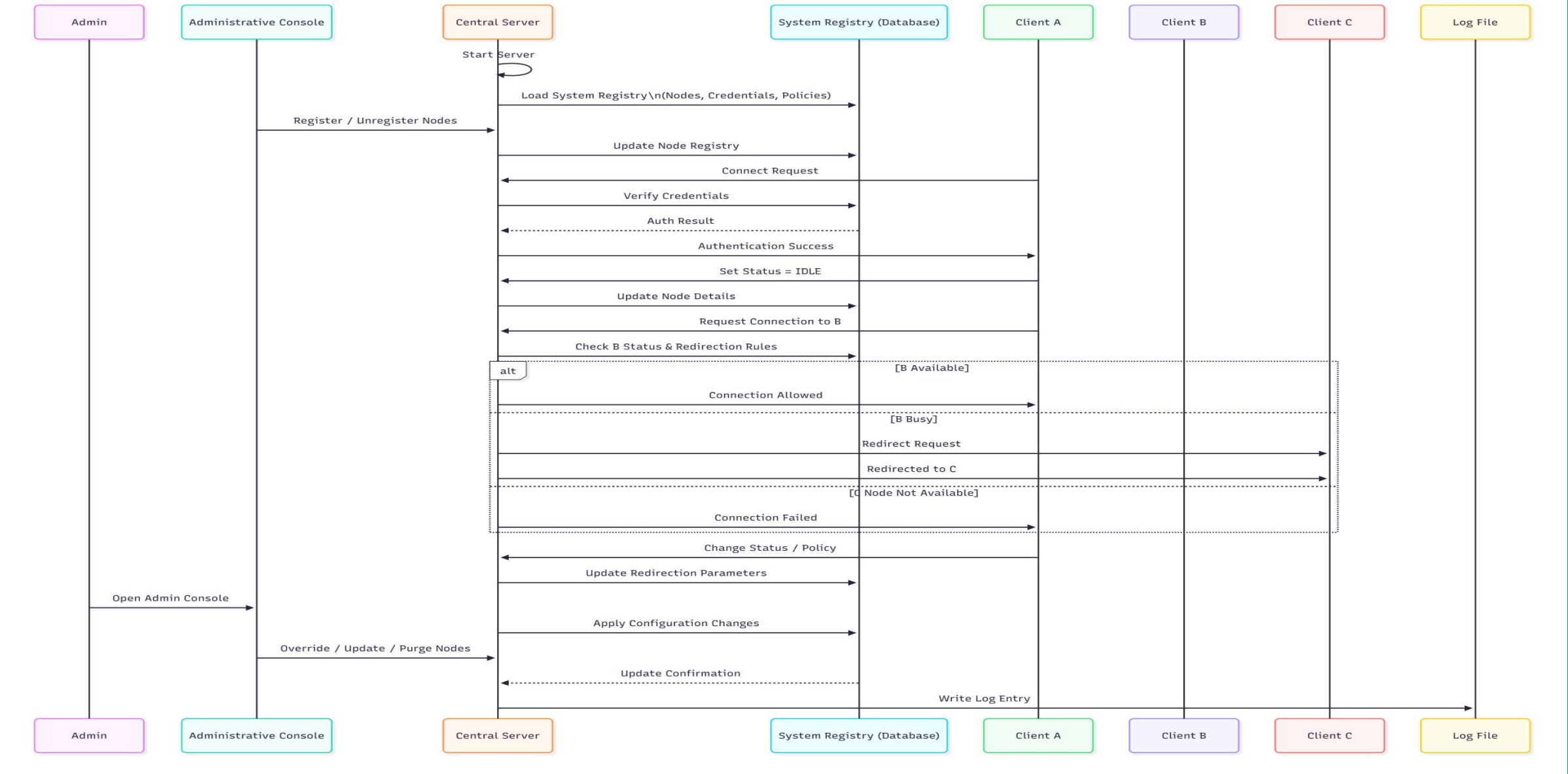
- Communication fails when destination nodes are busy or unavailable.
- Traditional systems lack dynamic redirection mechanisms.
- No centralized monitoring of node status.
- Inefficient routing reduces reliability and performance.
- A secure, centralized routing system is needed to ensure seamless communication.

Dynamic Connection Routing & Management System (DCRMS)

SOLUTION:

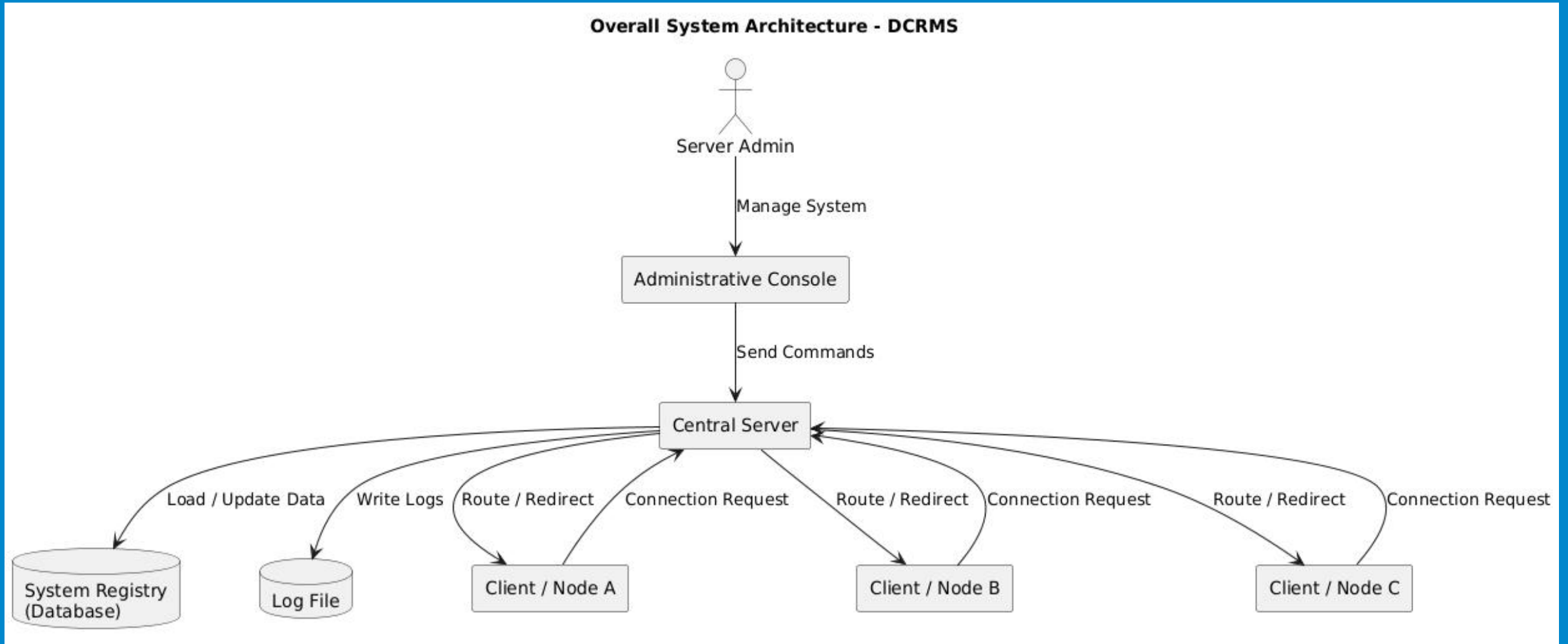
- A **centralized Routing Engine** monitors and manages all node communications.
- A **real-time node registry** tracks availability and status of each endpoint.
- **Dynamic Redirection Protocols** automatically reroute sessions if a node is busy or unavailable.
- **Secure authentication mechanisms** ensure only authorized nodes can connect.
- **Persistent storage (file/database-based)** maintains node records and configurations.
- **Multi-level logging system** records connection events, routing decisions, and errors for diagnostics.
- The system ensures **reliable, efficient, and uninterrupted communication flow**.

Sequence diagram:

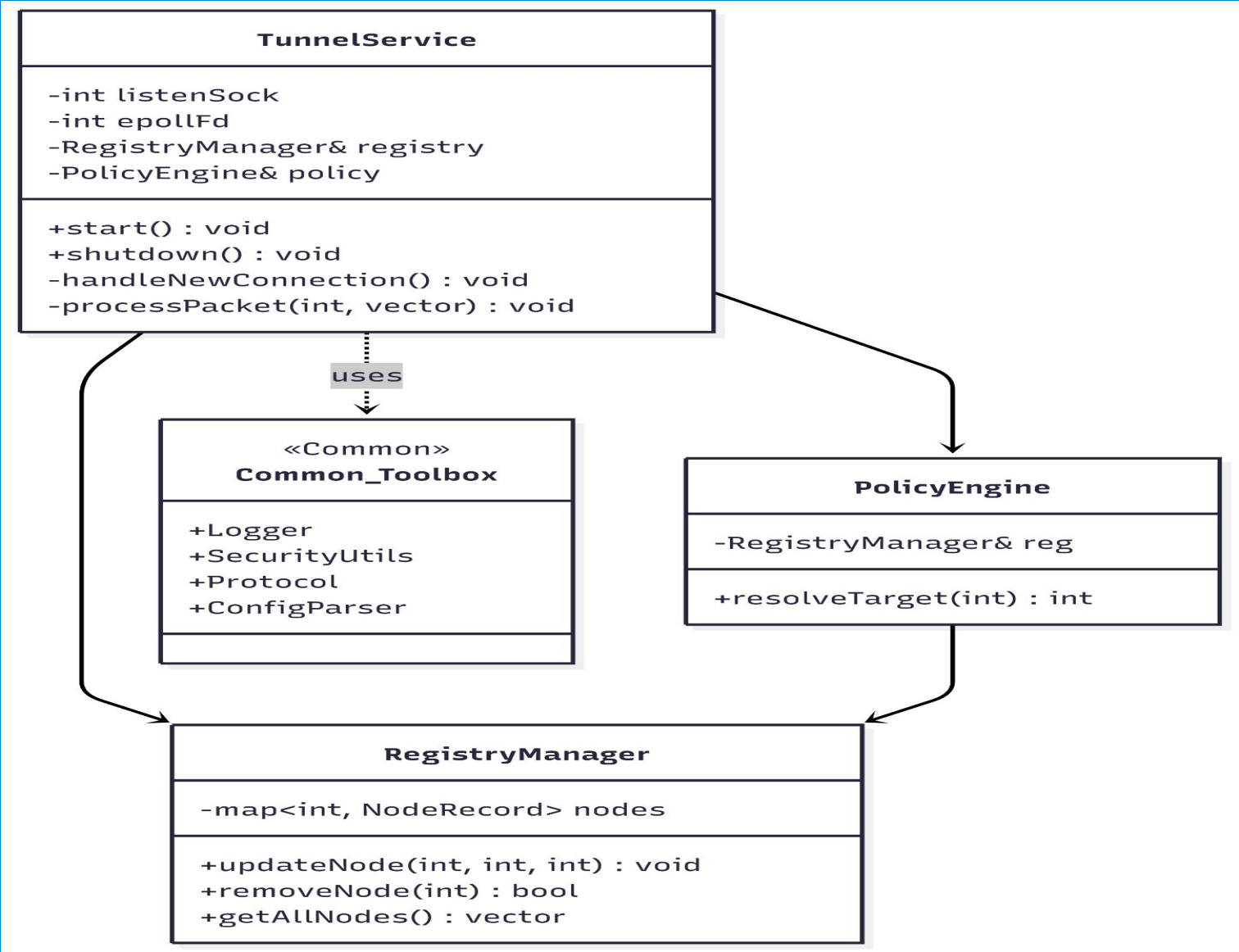


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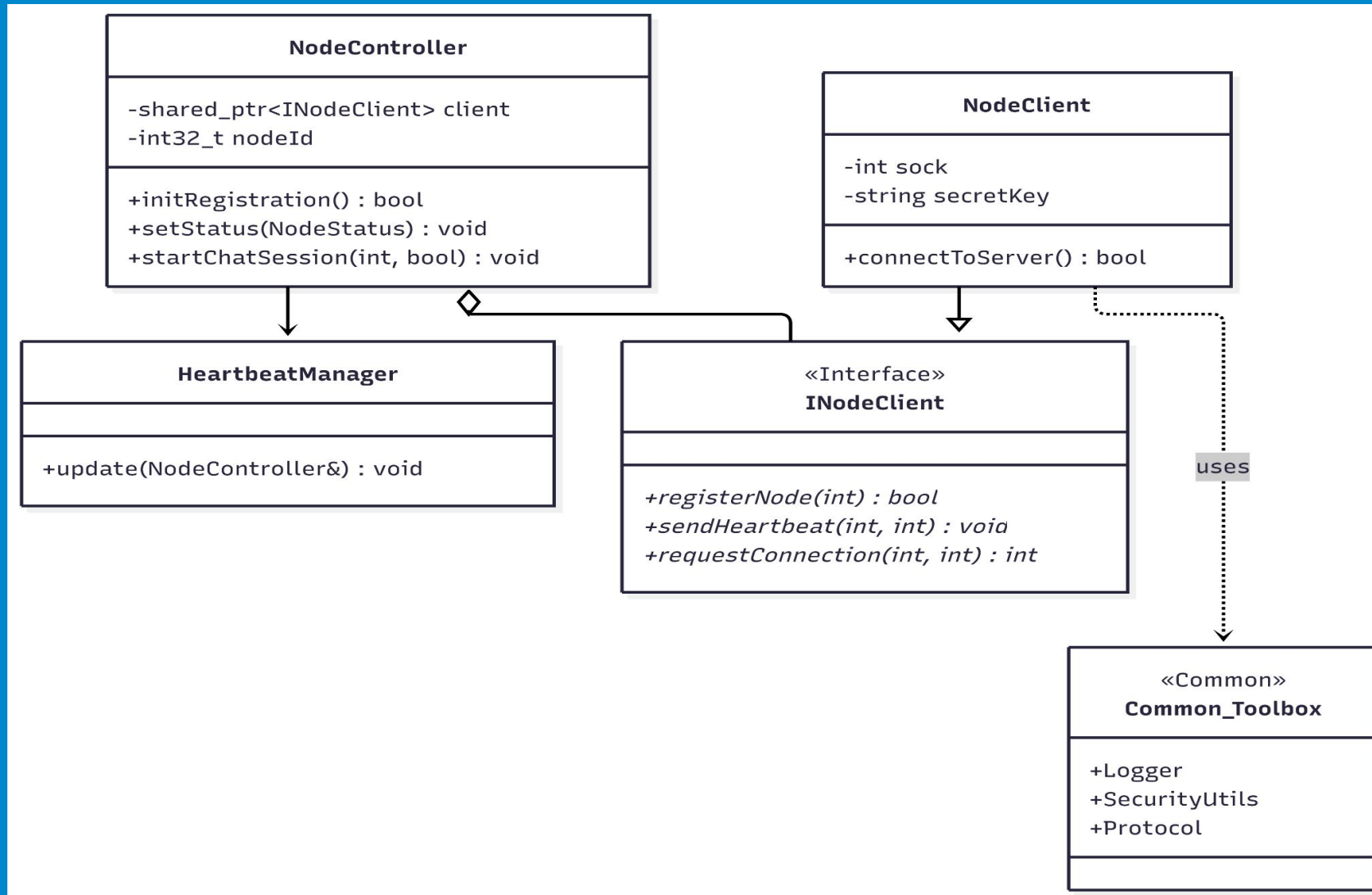
WORKFLOW:



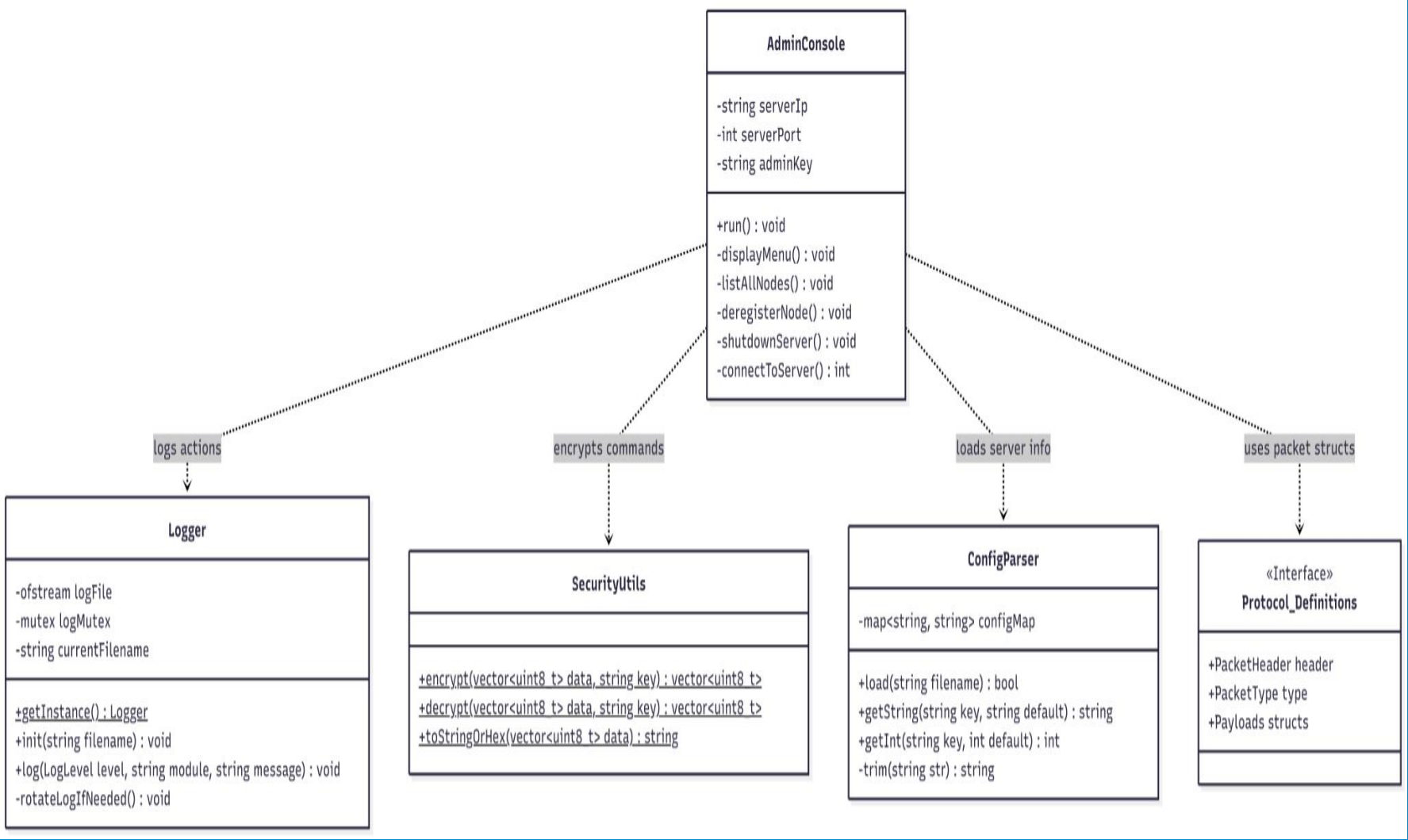
SERVER CLASS DIAGRAM:



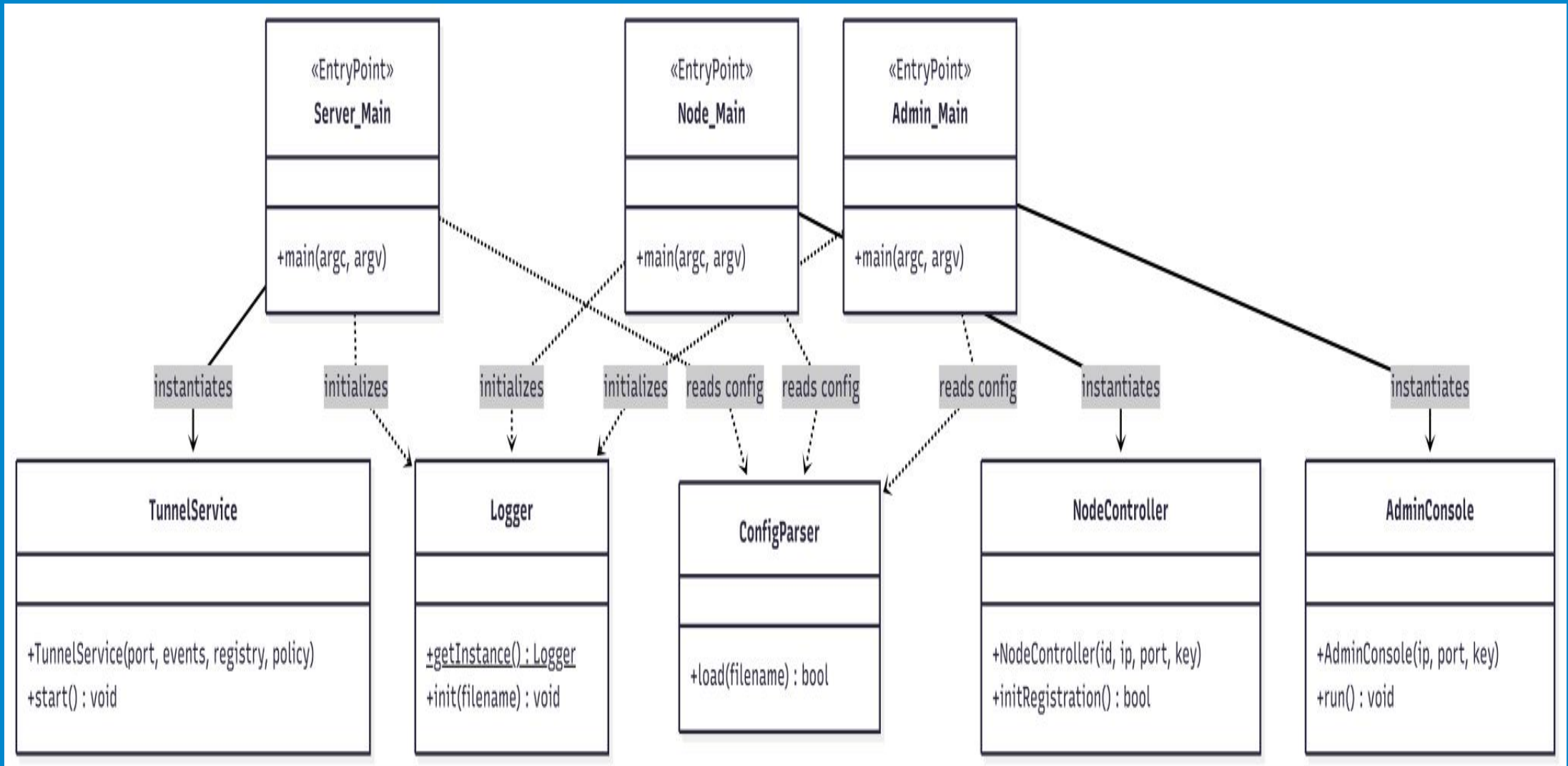
NODE CLASS DIAGRAM:



ADMIN CLASS DIAGRAM:



ENTRY POINT CLASS DIAGRAM:



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PRACTICAL OUTCOMES

Step 1: Start the server

```
student@student-virtual-machine:~/25SUB4508/Final_Capstone/dcrms$ ./apps/server_app

=====
SECURE DCRMS PORTAL STARTED
=====
[OPERATIONAL] Logger Initialized
[OPERATIONAL] Configuration Loaded
[OPERATIONAL] Registry & Policy Engine Ready
[OPERATIONAL] Listening on Port: 8080
=====
>> Server is running. Press Ctrl+C to shutdown.
```

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Step 2: Node Start Process And Menu

```
student@student-virtual-machine:~/25SUB4508/Final_Capstone/dcrms$ ./apps/node_app 101
[OPERATIONAL] Registering Node ID 101 with Server...
[SUCCESS] Registration Verified.

=====
DCRMS NODE [101] CONTROL
=====
[POLICY: DISABLED]
-----
1. Set Status: AVAILABLE
2. Set Status: BUSY
3. Show Current Status
4. Configure Redirection Policy
5. Connect (Chat)
7. Exit
Selection >> s
```

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Step 3:Admin Started

```
student@student-virtual-machine:~/25SUB4508/Final_Capstone/dcrms$ ./apps/admin_app

=====
DCRMS ADMIN CONTROL PANEL
=====

1. List Registered Nodes
2. Deregister (Purge) Node
3. Shutdown Server (Global)
9. Exit
Selection >> █
```

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Step 4:List of nodes created

```
--- DCRMS NETWORK STATUS ---
Total Nodes: 2
.....
ID      | Status      | Policy Mode | Redir Target | Last Active (IST)
.....
102     | AVAILABLE   | DISABLED    | 0             | 2026-02-12 10:54:50
101     | AVAILABLE   | DISABLED    | 0             | 2026-02-12 10:54:50
.....
```

Dynamic Connection Routing & Management System (DCRMS)

Step 5:Redirection Policy Configured

```
[POLICY: DISABLED]
-----
1. Set Status: AVAILABLE
2. Set Status: BUSY
3. Show Current Status
4. Configure Redirection Policy
5. Connect (Chat)
7. Exit
Selection >> 4

--- Configure Redirection ---
1. Local (Conditional)
2. Global (Always)
3. Disable
>> 2
Target ID: 103

=====
DCRMS NODE [102] CONTROL
=====
[POLICY: GLOBAL -> 103]
-----
```

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Step 6: Inter-Node Message Passing Via Server (After redirection)

```
=====
DCRMS NODE [101] CONTROL
=====
[POLICY: DISABLED]
-----
1. Set Status: AVAILABLE
2. Set Status: BUSY
3. Show Current Status
4. Configure Redirection Policy
5. Connect (Chat)
7. Exit
Selection >> 5
Target Node ID: 102
[OPERATIONAL] Sending request to Node 102...
[OPERATIONAL] Waiting for response...

-----
[OPERATIONAL] Redirected -> Node 103
Connected. Type message or '/quit'.
-----
[You]: hi
[Node 103]: hello node 101
[You]: s
```

Dynamic Connection Routing & Management System (DCRMS)

STORYBOARD:

	Aditya Choudhury	Rudranil Pal	Sarabesh Kanishkar V	Anirudh M
SRS	Worked on functional requirements (server)	Worked on functional requirements (admin)	Worked on functional requirements (node)	Worked on functional requirements (encryption & logging)
DESIGN	Class diagram	Sequence diagram	Use case diagram	Flow chart
CODE	Server	Admin	Nodes	Encryption & Security
CUT	Collaboratively Designed The Test Cases and RTM			

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LIMITATIONS:

- The system is designed for a **simulated environment**, not deployed on a large-scale real network.
- Scalability may be limited for extremely high concurrent node connections.
- Redirection policies are rule-based and do not use AI-based optimization.
- Single centralized Routing Engine may become a bottleneck if not scaled.
- Security mechanisms are basic and may require enhancement for enterprise-level deployment.

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CONCLUSION:

- The DCRMS successfully implements a **centralized routing framework** for managing node communication.
- It dynamically reroutes sessions when endpoints are unavailable or busy.
- The system ensures **secure authentication and structured logging**.
- It improves communication reliability and efficient resource utilization.
- The project demonstrates practical understanding of **network orchestration, routing logic and system design principles**.

Thank You