Use Case 1: Configure Simulation Settings

Description: The Simulation Administrator defines the parameters for radar stations and consumer clients in order to customize the simulation.

Actors:

1. Simulation Administrator

Preconditions:

1. The System is accessible and ready to accept configuration settings.

Flow:

1. The Simulation Administrator accesses the simulation settings interface.
2. The System establishes a remote connection and retrieves Radar and Consumer Client Catalogs.
    2.1. If The System connection was not established, The system displays a message that the connection to the remote catalogs was not established.
    2.2. The System retrieves the local copy of Radar and Consumer Client Catalogs, allowing The Simulation Administrator to proceed with configuring the simulation even without an active connection to the remote catalogs.
3. The System presents an interface/catalog allowing the Simulation Administrator to select the type and the desired number of radar stations and consumer clients, as well as the data transmission interval for the radars.
4. The Simulation Administrator selects the desired radar and catalog type, number of radar stations, the number of consumer clients, and the data transmission interval for the radars.
5. The Simulation Administrator sets the period of simulation.
6. The Simulation Administrator submits the configuration.
7. The System validates the inputs and updates the simulation settings accordingly.
8. The System will save the configuration settings in the simulation catalog remotely and locally.
    8.1. If the remote connection was not established The System saves and adds the configuration settings in the simulation catalog locally. This local storage ensures that the configuration is not lost and can be synchronized with the remote catalog once the connection is restored.
    8.2. Once the connection is established again, the system will transfer the locally saved configuration settings to the remote simulation catalog, making them accessible for future use.

Postconditions:

1. The simulation settings will be added to the configuration catalog.

Use Case 2: Define Radar Station

Description: The System creates a new type of a radar by parameters provided by the user to be added to the radar catalog.

Actors:

1. Simulation Administrator

Preconditions:

1. The radar generation parameters have been properly defined.

Flow:

1. The System establishes a remote connection and retrieves the Radar catalog saved remotely.
    1.1. If the remote connection was not established The System then retrieves the local copy of Radar catalog..
2. The System presents an interface displaying radar types available in Radar catalog and prompting the Simulation Administrator to define a new radar type.
3. The Simulation Administrator passes in the parameters (required unique_id and data transmission interval) for the radar station.
4. The System saves and adds the radar station to the radar catalog remotely.
    4.1. If the remote connection was not established, The System saves and adds the radar station to the radar catalog locally.This local storage ensures that the radar station is not lost and can be synchronized with the remote catalog once the connection is restored.
    4.2. Once the connection is established again, the system will transfer the locally saved radar station to the remote radar catalog, making it available for use in simulations.

Postconditions:

1. A new type of radar station is created and saved and will be ready to be used in a simulation.

Use Case 3: Define Consumer Client

Description: The System creates a new type of client by parameters provided by the user to be added to the client catalog.

Actors:

1. Simulation Administrator

Preconditions:

1. The client parameters have been decided.

Flow:

1. The System establishes a remote connection and retrieves the Consumer Client catalog.
    1.1. If the remote connection was not established The System then retrieves the local copy of the Consumer Client catalog.
2. The System presents an interface prompting desired parameters allowing the Simulation Administrator to define a new consumer client type.
3. The Simulation Administrator passes in the required parameters.
4. The System saves and adds the new client to the Consumer Client catalog remotely.
    4.1. If the remote connection was not established The System saves and adds the new client to the Consumer Client catalog locally.

Postconditions:

1. A new type of consumer client is created and saved and will be ready to be used in a simulation.

Use Case 4: Generate Reports

Description: The System compares and contrasts the data transmitted by the radar station and the data received by the consumer client. Then it checks whether the data is transmitted successfully.

Actors:

1. Simulation Administrator

Preconditions:

1. Radar stations have been instantiated and actively transmitting data and the consumer clients have been instantiated and actively receiving data.
2. The simulation has run for a specified period or reached a designated stopping condition.
3. Simulation transcript is available.

Flow:

1. The Simulation Administrator starts the report generation process.
2. The System retrieves the simulation transcript.
3. The System compares and contrasts the record data, ensuring its accuracy, consistency, and completeness.
4. The System generates comprehensive reports summarizing the benchmarking results.
5. The System saves the report locally and remotely before presenting it to the Simulation Administrator.
    a. If the remote connection was not established The System only saves the report locally and waits for the connection to become available again.
6. The System presents the generated reports to the Simulation Administrator for review and analysis.

Postconditions:

1. Report summarizing the benchmarking results is generated for the lifespan duration of the radars and clients.

Use Case 5: Run Simulation

Description: The System loads a pre-defined simulation configuration, instantiates radar stations and consumer clients based on the loaded configuration, and enables the transmission of data from the radar stations to the S6 node and from the S6 node to the clients, creating a simulation transcript .

Actors:

1. Simulation Administrator

Preconditions:

1. The simulation configuration exists with predefined settings for radar stations and consumer clients.
2. S6 node is accessible and its API interface is available.
3. Remote storage is accessible and its API interface is available.

Flow:

1. The System displays the simulation configuration
2. The Simulation Administrator selects the configuration from the configuration catalog
3. The System retrieves the simulation configuration.
4. The System instantiates a new simulation transcript and stores it remotely.
5. The System instantiates radar stations based on the defined parameters in the configuration and adds them to the simulation transcript.
6. The System instantiates consumer clients based on the defined parameters in the configuration catalog and adds them to the simulation transcript.
7. The System establishes the necessary connections between the radar stations and the S6 node and updates client connection records remotely.
    7.1. If the S6 node connection was not established an error message is presented to the Simulation Administrator.
8. The System starts the transmission of messages from the radar stations to the S6 node and stores the message records remotely.
    8.1. In the event of a crash or failure during the simulation, where the transmission of messages is interrupted, the System will initiate a recovery process. As part of this process, the System will retrieve the simulation transcript, for the messages that were successfully transmitted, from remote storage.
        8.1.1. If remote retrieval of records fails then The System will attempt to retrieve the simulation transcript from local storage.
9. The System establishes the necessary connections between the S6 node and consumer client and updates client connection records remotely.
    9.1. If the S6 node connection was not established an error message is presented to the Simulation Administrator.

10. The consumer client starts receiving the processed data from the S6 node and stores the simulation records remotely.
    10.1. In the event of a crash or failure during the simulation, where the transmission of messages is interrupted, the System will initiate a recovery process. As part of this process, the System will retrieve the simulation transcript for the messages that were successfully transmitted from the remote storage.
        10.1.1. If remote retrieval of records fails then The System will attempt to retrieve the simulation transcript from local storage.
11. The System monitors and logs the data transmission process for analysis and verification from both the radar and the consumer client.

Postconditions:

1. The simulation configuration is successfully loaded and validated.
2. The client records generated have been recorded.
3. The simulation transcript is ready for benchmarking and performance evaluation.