User Manual: Starway—A Next-Generation LEO Space Traffic Management System

Version: 1.0
Project: StarwayDispatchPlugin for UC-winRoad
Date: September 10, 2026

Abstract

StarwayDispatch is a high-performance, autonomous airspace scheduling plugin developed using the UC-winRoad C++ SDK. It provides a comprehensive "Digital Brain" solution for Urban Air Mobility (UAM) simulations, featuring real-time congestion monitoring, scientific density evaluation, and adaptive lane-changing maneuvers. This manual provides detailed instructions for deployment, operational procedures, and technical configuration.

1. Introduction

The StarwayDispatch system is designed to transform passive traffic simulations into active, intelligent management environments. By intercepting thousands of background traffic units via SDK hooks, the system implements autonomous coordination across complex aerial networks, including bridge-type structures where logical road data might be incomplete.

2. Installation and Deployment

2.1 System Requirements

Simulation Platform: UC-winRoad 16.0 or higher.
Operating System: Windows 10/11 (x64).
Runtime Environment: Microsoft Visual C++ Redistributable.

2.2 Deployment Steps

Locate the compiled binary file: StarwayDispatchPlugin.dll.
Copy the DLL file into the Plugins directory of your UC-winRoad installation path.
Launch UC-winRoad and navigate to the External Link/Plugin Manager to enable "Starway Dispatch".
Upon successful loading, the [Starway Dispatch] tab will appear in the main Ribbon menu as Fig1.



Fig 1. Starway Dispatch Ribbon Tab in UC-winRoad

3. User Interface Architecture

The interface is divided into five functional modules, accessible via the Ribbon UI:

3.1 Scenarios Module

Private+New: Generates custom flight units.

Congestion: Triggers pre-defined high-density traffic scenarios.

Switch/Reset: Manages simulation states and clears active units.

3.2 Macro Control Module

Adaptive Scheduling (Checkbox): The master switch for the autonomous dispatch engine.

Statistics: Opens the real-time data dashboard.

Rules: Accesses the algorithm calibration window.

3.3 Micro Guidance Module

Directional Buttons (North, West, East): Allows manual steering of selected aircraft for path adjustment.

3.4 Rescue & Safety Module

Accident Search: Automatically focuses the camera on the nearest emergency event.

Rescue Monitor: Tracks the status and location of emergency response units.

3.5 Time & Era Module

Initial Era: Synchronizes the simulation timeline and environmental settings.

4. Core Functionality & Operational Logic

4.1 Scientific Density Monitoring

Unlike simple counting, the system calculates load using the formula:

Density (ρ) = Real-time Count / Road Length.

Routes are rendered in 3D using a four-tier color system:

Green: Smooth ($\rho \leqslant$ 25% Threshold)

Yellow: Slow ($\rho \leqslant$ 60% Threshold)

Orange: Busy ($\rho \leqslant$ 100% Threshold)

Red: Jammed ($\rho >$ 100% Threshold)

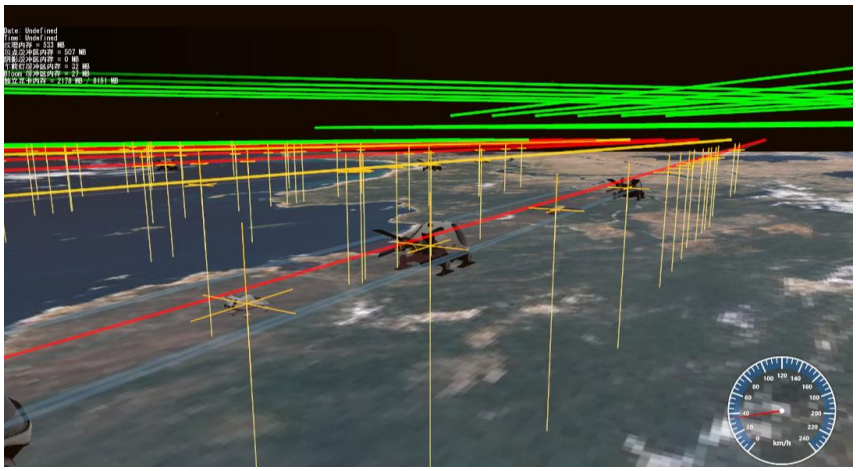


Fig 2.Comparison of 3D Route Colors in the simulation environment

4.2 Adaptive Lane-Change (ALC)

When Adaptive Scheduling is enabled, the system intercepts background traffic. If a route is "Jammed," the engine scans for the least busy alternative and initiates a 3-stage maneuver:

Ascend: Vertical climb to clear traffic.

Lateral Shift: Horizontal movement to the target route via Virtual Nodes.

Descend: Precision merge into the new flight path.

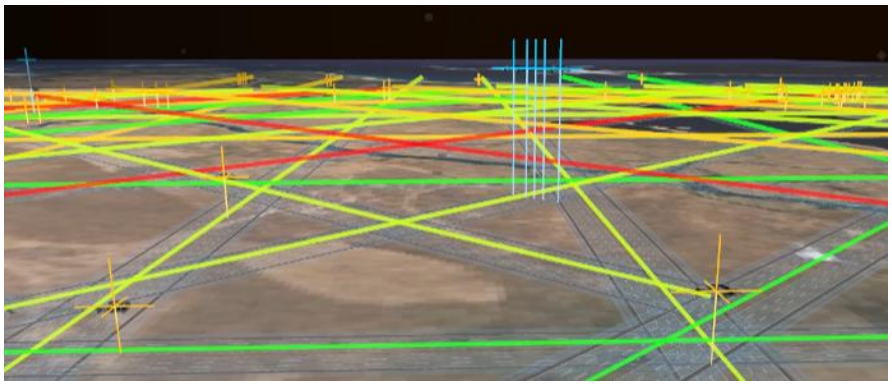


Fig 3. Visual sequence of the 3-stage lane change maneuver with Blue Cross markers

5. Technical Configuration (Rules Panel)

Users can fine-tune the "Digital Brain" via the Rules Configuration window:

Density Thresh: Adjusts the sensitivity of congestion detection (Default: 0.005).

Min Safety (m): Defines the minimum collision avoidance radius (Default: 40.0m).

Max Capacity: Sets the upper limit for route load evaluation.

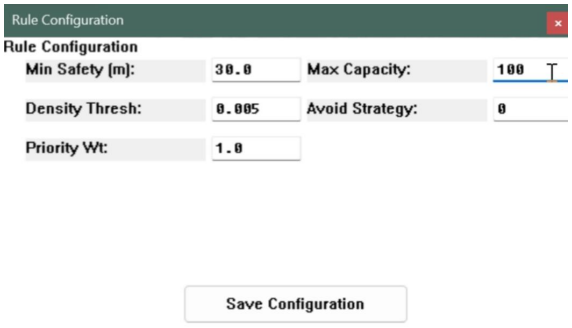


Fig 4. The Rule Configuration Window showing adjustable parameters

6. Data Analysis (Statistics Dashboard)

The Statistics Dashboard provides high-fidelity tracking of 1,500+ units:

In-flight aircraft: Total active units tracked by the plugin.

Avg Speed: Real-time average velocity across the network.

Route Distribution: Detailed list of every route (R0-R25) showing vehicle count, utilization percentage, and current status label.

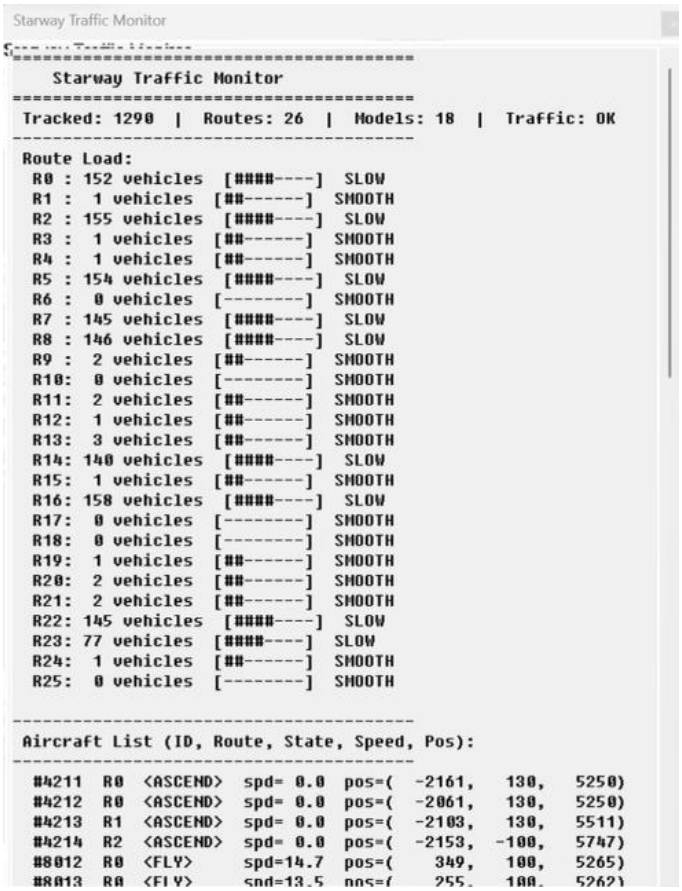


Fig 5. Starway Statistics Dashboard showing real-time traffic data

7. Conclusion

StarwayDispatch provides a robust framework for testing future UAM concepts. By bridging the gap between static simulation and dynamic coordination, it ensures high-efficiency airspace utilization and zero-collision safety standards.

Contact & Support

For technical support regarding the StarwayDispatchPlugin, please refer to the source documentation in F8main.cpp.