BFMC 2026 – Project Status Report #1

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1. Project Overview

During the first development sprint, we focused on establishing a solid technical baseline for participation in the Bosch Future Mobility Challenge (BFMC) 2026. The primary goal of this phase was to ensure that the vehicle platform, software stack, and simulation tools were correctly installed, configured, and validated.

This initial stage is critical to guarantee a reliable foundation for future autonomous driving features. Special emphasis was placed on understanding the provided BFMC architecture, verifying hardware–software communication, and ensuring compliance with the competition requirements.

2. Completed Tasks

2.1 Vehicle Bring-Up and Start-Up Code Execution

The official BFMC start-up code has been successfully deployed on the physical vehicle. We validated the correct boot sequence and verified stable operation of the control pipeline.

Key achievements include:

- Successful execution of the provided start-up scripts.
- Stable communication between the onboard computer and the low-level control unit.
- Verified actuation of steering and throttle commands.
- Reliable system response during repeated test runs.

This confirms that the vehicle is operational and ready for higher-level control and autonomy development.

2.2 ROS Environment Installation and Configuration

The Robot Operating System (ROS) environment has been installed on a separate dedicated computer together with the Gazebo simulator. At this stage, we are configuring and validating the ROS-Gazebo integration so that the provided BFMC packages run correctly in simulation. The setup is based on the official repositories and configuration files provided by the BFMC competition through the GitHub repository, to ensure alignment with the competition architecture and simulation requirements.

The following tasks were completed:

- Installation of required ROS distributions and dependencies.

- Validation of ROS node execution and topic communication.
- Initial configuration for modular integration of perception, control, and planning nodes.

ROS provides a scalable and modular framework that will support future development stages and sensor fusion strategies.

2.3 Gazebo Simulator Setup and Validation

The Gazebo simulator has been installed and is currently being configured and validates for BFMC development. We are running initial test scenarios to confirm stable physics, sensor emulation, and compatibility with the planned software architecture.

Validated aspects include:

- Correct vehicle spawning and control within simulation.
- Stable physics simulation and sensor emulation.
- Feasibility of using Gazebo for perception and control prototyping.

Gazebo is intended to serve as the primary environment for safe, repeatable testing before deploying algorithms on the physical vehicle.

3. Hardware Planning and Required Components

To support future autonomous functionalities, we defined a preliminary list of required hardware components for system expansion.

Planned components include:

Battery: LiPo battery (2S or 3S) with XT90 connector.

Main Compute Unit: NVIDIA Jetson Orin Nano Developer Kit, selected for its real-time AI processing capabilities.

LiDAR Sensor: 360-degree LiDAR sensor for environment perception and obstacle detection.

Proximity Sensors: Time-of-Flight distance sensors for short-range obstacle awareness and redundancy.

Estimated total budget (excluding battery): 370 USD.

4. Evidence and Demonstration

The accompanying video submission provides visual evidence of the completed tasks. It demonstrates:

- Successful execution of the start-up code on the physical vehicle.
- Basic vehicle control and system responsiveness.

The video directly supports the technical claims described in this report.

5. Next Development Steps

For the next phase, we will focus on:

- Integrating camera input into the control loop.
- Establishing a basic perception-to-actuation pipeline (camera to steering).
- Developing initial autonomous behaviors in simulation.
- Preparing the hardware platform for sensor integration.

These objectives align with the requirements of the second BFMC project status milestone.

6. Current Project Status Summary

Vehicle control:	Operational
Start-up code:	Verified
ROS environment:	Installed on dedicated simulation computer (configuration in progress)
Gazebo simulator:	Installed (configuration and validation in progress)
Autonomous features:	In development