Chapter 8 — Mapping (Cartographer)

[DIAGRAM — CARTOGRAPHER MAPPING FLOW]

LiDAR → Scan Data → Cartographer Node → SLAM Algorithm → 2D Map Built in Real Time

1. Overview

Cartographer is a SLAM (Simultaneous Localization And Mapping) system that builds a 2D map as the robot drives. It uses LiDAR data to detect walls, objects, and open space.

2. Start the Mapping System

First start robot bringup:
roslaunch r2_bringup minimal.launch

Then start Cartographer:
roslaunch r2_slam cartographer.launch

3. Move the Robot Slowly

Drive at **0.15 m/s** so LiDAR scans overlap correctly.
Keep turns smooth and avoid sudden rotations.

4. Watch the Map Form

In RViz:
• Add 'Map' display
• Add 'LaserScan' display
You will see walls and rooms appear as the robot moves.

5. Loop Closure

Cartographer improves the map when the robot revisits the same area. This helps fix drift and creates a more accurate final map.

6. Save the Map

When done mapping:
rosrun map_server map_saver -f mymap

This creates:

• mymap.yaml
• mymap.pgm

7. Load a Saved Map

To use the map later:
roslaunch r2_navigation map_load.launch map_file:=mymap.yaml

8. Good Mapping Tips

• Move slowly.
• Avoid sharp turns.
• Keep LiDAR clean.
• Map in a loop shape.
• Avoid reflective surfaces.

9. Safety Notes

• Do not block LiDAR.
• Watch for people or pets.
• Keep hands clear of wheels.
• Stop immediately if robot becomes unstable.