# DistributedMobilityDB Docker Image (PostgreSQL 16 + Citus + MobilityDB)

This document records the detailed steps and modifications taken to build a working Docker image for **DistributedMobilityDB** on top of **PostgreSQL 16**, **Citus**, and **MobilityDB**. These steps are critical for troubleshooting.

## Base Image

**Base Image Used:** pg16\_with\_mobility\_citus:latest (read Citus Docker Image documentation)

This is a custom image that already contains PostgreSQL 16 with MobilityDB and Citus built and installed.

## Key Extensions and Dependencies Installed

RUN apt-get update && apt-get install -y \  
 cmake build-essential \  
 clang llvm \  
 curl \  
 postgresql-server-dev-16 \  
 libpq-dev \  
 libproj-dev libgeos-dev libjson-c-dev \  
 libssl-dev pkg-config \  
 liblz4-dev libkrb5-dev \  
 postgresql-16-postgis-3

These are needed for building DistributedMobilityDB.

## Header File Adjustments

### Citus Headers

To make Citus headers available to the DistributedMobilityDB build system:

RUN cp -r /usr/local/src/citus/src/include/. /usr/include/postgresql/16/server/

### PostGIS Headers (Manual Installation)

We had to manually provide missing PostGIS headers:

* liblwgeom.h
* lwinline.h
* postgis\_config.h
* postgis\_revision.h

We copied these from a local directory mounted at:

COPY headers/liblwgeom.h /usr/include/postgresql/16/server/postgis/liblwgeom.h  
COPY headers/lwinline.h /usr/include/postgresql/16/server/postgis/lwinline.h  
COPY headers/postgis\_config.h /usr/include/postgresql/16/server/postgis\_config.h  
COPY headers/postgis\_revision.h /usr/include/postgresql/16/server/postgis/postgis\_revision.h

These were **required to resolve include errors in** distributed\_mobilitydb\_planner.c and liblwgeom.h.

## Code Patches to DistributedMobilityDB Source

### 1. Header Fixes

Added the following includes manually in the distributed\_mobilitydb\_planner.c:

#include **"postgres.h"**#include **"fmgr.h"**#include **"access/sdir.h"**   
#include **"access/genam.h"**   
#include **"nodes/pg\_list.h"**#include **"distributed/relation\_utils.h"**   
#include **"nodes/bitmapset.h"**#include **"nodes/primnodes.h"**#include **"nodes/execnodes.h"**#include **"optimizer/paths.h"**#include **"utils/rel.h"**#include **"utils/lsyscache.h"**#include **"catalog/pg\_type.h"**#include **"executor/executor.h"**#include **"nodes/nodes.h"**#include **"parser/parse\_node.h"**#include **"parser/parse\_expr.h"**#include **"parser/parse\_relation.h"**#include **"parser/analyze.h"**#include **"liblwgeom.h"**

### 2. Fixed GetRteNode Signature Mismatch

The function was declared in distributed\_mobilitydb\_explain.c as:

extern Rte \*GetRteNode(Node \*node, RteType rteType, Alias \*alias);

But defined differently in the .c file:

static Rte\* GetRteNode(Node \*node, int rteType, void \*alias)

We changed the **definition** to match the **declaration**.

### 3. Commented Out Broken AnalyseCatalog Line

In analyzeDistributedSpatiotemporalTables, the following line caused compile failure:

// spatiotemporal\_table->catalogFilter = AnalyseCatalog(...);

We commented it out to proceed.

### 4. Changed the function CreateDistributedTable, in order for it to work with our specific data

In multi\_phase\_executor.c, find the line with the function and change it to:

CreateDistributedTable(reshuffled\_table\_oid, **"vessel\_id"**, DISTRIBUTE\_BY\_RANGE, 0, false, NULL);  
  
**The vessel\_id was set beforehand as this is the variable that was used in the dataset and will not work for other datasets.**

## Building DistributedMobilityDB

RUN cd /usr/local/src/distmob && mkdir build && cd build && \  
 cmake .. \  
 -DCMAKE\_C\_FLAGS="-I/usr/include/postgresql/16/server" \  
 -DCMAKE\_EXE\_LINKER\_FLAGS="-Wl,--unresolved-symbols=ignore-in-object-files" && \  
 make -j$(nproc) && make install

This build completes successfully **only** with the above header injections and code patches.

## Fixing missmatched folders

Move .so file to PostgreSQL's actual lib path:

mv /usr/local/pgsql/lib/libdistributed\_mobilitydb-1.0.so /usr/lib/postgresql/16/lib/distributed\_mobilitydb.so **&&** \

Move control and SQL files to PostgreSQL's extension path:

mv /usr/local/pgsql/share/extension/distributed\_mobilitydb\* /usr/share/postgresql/16/extension/ **&&** \

Clean up source code:

cd / **&&** rm -rf /usr/local/src/distmob

This allows the extension to be visible by PostgreSQL.

## Key Assumption from Now On

When referring to DistributedMobilityDB, it is assumed you are referring to **this modified, patched, and custom-built version**.

## Recommendations for Future Debugging

* If compilation fails, first check distributed\_mobilitydb\_planner.c and distributed\_mobilitydb\_explain.c.
* Validate all PostGIS headers are still mounted/copied correctly inside /usr/include/postgresql/16/server/postgis/ .
* Look for outdated or incompatible function signatures (e.g., due to PostgreSQL 16 changes).

## Notes

* This build is not portable across PostgreSQL versions without similar header patching.
* Future upstream changes may fix or break compatibility with PostgreSQL 16. Manual patching will still be needed unless official support is added.