# Dokumentacija tablica

# Shema

## Shema: fleet

## DDL u startu radi: drop schema if exists fleet cascade; create schema fleet; sve se gradi unutar fleet.

# Šifrarnici (dc\_\*)

## fleet.dc\_vehicle\_make

Svrha: Popis proizvođača vozila.

PK: make\_id (bigserial).

Stupci: name (unique, text, not null).

Ograničenja: name unique.

## fleet.dc\_vehicle\_model

Svrha: Modeli vozila povezani s proizvođačem.

PK: model\_id (bigserial).

Stupci: make\_id (bigint, not null),

name (text, not null).

FK: make\_id → dc\_vehicle\_make(make\_id) (on delete restrict).

Ograničenja: unique(make\_id, name).

## fleet.dc\_vehicle\_category

Svrha: Kategorije vozila (npr. kombi, osobno, kamion).

PK: category\_id (bigserial).

Stupci: name (unique, text, not null).

Ograničenja: name unique.

## fleet.dc\_fuel\_type

Svrha: Vrste goriva/energenta (DIESEL, PETROL, EV…).

PK: fuel\_type\_id (bigserial).

Stupci: code (unique, text, not null),

label (text).

Ograničenja: code unique.

# Jezgra

## fleet.employee

Svrha: Zaposlenici.

PK: employee\_id (bigserial).

Stupci: first\_name (not null, text),

last\_name (not null, text),

email (text),

phone (text).

## fleet.driver

Svrha: Vozači su podskup zaposlenika.

PK: driver\_id (bigint)

FK : driver id -> employee(employee\_id) (on delete cascade).

Stupci: license\_no (not null, text),

license\_issue\_at (date),

license\_expire\_at (date).

## fleet.vehicle

Svrha: Registar vozila.

PK: vehicle\_id (bigserial).

FK: model\_id → dc\_vehicle\_model (model\_id) (on delete restrict),

category\_id → dc\_vehicle\_category (category\_id),

fuel\_type\_id → dc\_fuel\_type (fuel\_type\_id).

Stupci: registration\_number (unique, text, not null),

vin (unique, text, not null),

model\_id (not null, bigint),

category\_id (bigint),

fuel\_type\_id (bigint),

year (int),

status (not null, text, default 'active', check in ('active','service','retired','sold')),

current\_odometer\_km (numeric, default 0, >=0),

created\_at (not null, timestamptz, default now()).

# Operativa

## fleet.vehicle\_assignment

Svrha: Dodjele vozila vozačima kroz vrijeme.

PK: assignment\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

driver\_id (not null, bigint) → driver (driver\_id) (on delete restrict).

Stupci: start\_at (not null, timestamptz),

end\_at (timestamptz),

notes (text).

## fleet.odometer\_reading

Svrha: Očitavanja kilometraže (km) po vremenu.

PK: reading\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade).

Stupci: reading\_at (not null, timestamptz),

odometer\_km (not null, numeric, >= 0),

is\_anomalous (not null, boolean, default false).

## fleet.fuel\_card

Svrha: Kartice goriva.

PK: fuel\_card\_id (bigserial).

Stupci: card\_no (unique, not null, text),

vendor\_name (text),

active (not null, boolean, default true).

## fleet.fuel\_transaction

Svrha: Transakcije točenja goriva/energije.

PK: fuel\_tx\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

driver\_id (bigint) → driver (driver\_id) (on delete set null),

fuel\_card\_id (bigint) → fuel\_card (fuel\_card\_id) (on delete set null).

Stupci: posted\_at (not null, timestamptz),

liters (not null, numeric, >= 0),

price\_per\_liter (not null, numeric, >= 0),

odometer\_km (not null, numeric, >= 0),

station\_name (text),

receipt\_number (text),

is\_suspicious (not null, boolean, default false) (dodano kasnije),

is\_card\_mismatch (not null, boolean, default false) (dodano kasnije).

# Održavanje

## fleet.vendor

Svrha: Serviseri/dobavljači usluga.

PK: vendor\_id (bigserial).

Stupci: name (not null, text),

address (text),

phone (text),

active (not null, boolean, default true).

## fleet.maintenance\_order

Svrha: Radni nalozi servisa/održavanja.

PK: mo\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

vendor\_id bigint → vendor (vendor\_id) (on delete set null).

Stupci: opened\_at (not null, timestamptz),

started\_at (timestamptz),

closed\_at (timestamptz),

status (not null, text, default ‘open’, status in('open','in\_progress','closed','cancelled'),

total\_cost (not null, numeric, default 0, >=0),

description (not null, text).

## fleet.maintenance\_item

Svrha: Stavke radnog naloga.

PK: item\_id (bigserial).

FK: mo\_id (not null, bigint) → maintenance\_order (mo\_id) (on delete cascade).

Stupci: work\_type (not null, text),

parts\_cost (not null, numeric, default 0, >=0),

labor\_cost (not null, numeric, default 0, >=0),

description (not null, text),

line\_total (not null, numeric, >=0, default 0) ( dodan kasnije) .

## fleet.planned\_service (opcionalno)

Svrha: Planovi servisa po datumu ili kilometraži; može se vezati na maintenance\_order.

PK: plan\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

mo\_id (bigint) → maintenance\_order (mo\_id) (on delete set null).

Stupci: due\_at (timestamptz),

due\_odometer (int), (check (due\_at is not null or due\_odometer is not null)),

description (not null, text),

status in (not null, text, default planned, status in ('planned','done','cancelled')),

created\_at (not null, timestamptz, default now ())

# Usklađenost / dokumenti

## fleet.insurance\_policy

Svrha: Police osiguranja po vozilu.

PK: policy\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade).

Stupci: provider (not null, text),

policy\_no (not null, text),

valid\_from (not null, timestamptz),

valid\_to (not null, timestamptz, check (valid\_to > valid\_from)),

premium\_amount (not null, numeric),

coverage\_notes (text).

Ograničenja: unique(vehicle\_id, provider, policy\_no).

## fleet.registration\_record

Svrha: Registracije po vozilu (povijesno).

PK: reg\_id bigserial.

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade).

Stupci: valid\_from (not null, timestamptz),

valid\_to (not null, timestamptz, check(valid\_to > valid\_from)),

fee\_amount (not null, numeric).

## fleet.dc\_document\_type (opcionalno)

Svrha: Dozvoljeni tipovi dokumenata (INSURANCE, REGISTRATION, SERVICE, OTHER).

PK: code.

Stupci : description (not null, text).

## fleet.document

Svrha: Metapodaci dokumenta.

PK: document\_id (bigserial).

FK: doc\_type\_code (not null, text) → dc\_document\_type (code) (on update cascade),

uploaded\_by (not null, bigint) → employee (employee\_id) (on delete restrict).

Stupci: url\_or\_path (not null, text, check regex ^(https?://|/).+),

uploaded\_at (not null, timestamptz, default now()),

is\_deleted (not null, boolean, default false).

## fleet.vehicle\_document

Svrha: Veza document – vozilo s tipom.

PK: vehicle\_document\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

document\_id (not null, bigint) → document (document\_id) (on delete restrict),

doc\_type\_code (not null, text) → dc\_document\_type(code) (on update cascade).

Ograničenja: unique(vehicle\_id, document\_id).

## fleet.inspection (opcionalno)

Svrha: Evidencija tehničkog pregleda.

PK: inspection\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade).

Stupci: inspected\_at (not null, timestamptz),

result (not null, text), (check result in (‘passed’,’failed’), if failed -> note not null),

note (text).

# Događaji

## fleet.fine

Svrha: Kazne (prometni prekršaji).

PK: fine\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

driver\_id (bigint) → driver (driver\_id) (on delete set null).

Stupci: issued\_at (not null, timestamptz),

amount (not null, numeric, > 0),

reason (not null, text),

paid\_at (timestamptz),

payment\_method (text).

## fleet.accident

Svrha: Nezgode/štete.

PK: accident\_id (bigserial).

FK: vehicle\_id (not null, bigint) → vehicle (vehicle\_id) (on delete cascade),

driver\_id (bigint) → driver (driver\_id) (on delete set null).

Stupci: happened\_at (not null, timestamptz),

severity (not null, text, severity in ('minor','major','total')),

description text,

cost\_estimate (numeric, >= 0).

# Pogledi (VIEW)

## fleet.v\_active\_assignments

Svrha: Trenutno aktivne dodjele (end\_at is null).

Izvor: vehicle\_assignment.

## fleet.v\_odo\_speed\_anomalies

Svrha: Izračun rasta km/dan i flagiranje anomalija (>1500 km/dan).

Izvor: odometer\_reading s lag(odometer\_km) i lag(reading\_at) stupcima.

## fleet.v\_planned\_service\_upcoming (opcionalno)

Svrha: Planirani servisi u 30 dana ili <= + 1000 km.

Izvor: planned\_service i odometer\_reading (max).

## fleet.v\_cost\_per\_km\_overall

Svrha: Trošak po kilometru po vozilu (gorivo + održavanje) za zadani obračunski period.

Izvor: fuel\_transaction, maintenance\_order i odometer\_reading.

## fleet.v\_odo\_speed\_anomalies

Svrha: Mjesečna agregacija potrošnje goriva po vozilu (koliko litara i koliki trošak po mjesecu).

Izvor: fuel\_transaction.

# Indeksi

maintenance\_order : ix\_mo\_status, ix\_mo\_vehicle\_status, ix\_mo\_vehicle\_opened\_at, ix\_mitem\_mo.

fuel\_transaction : ix\_fuel\_tx\_vehicle\_posted\_at, ix\_fuel\_tx\_mismatch\_only.

fleet.insurance\_policy : ix\_insurance\_vehicle\_period\_gist.

fleet.registration\_record : ix\_registration\_vehicle\_period\_gist.

fleet.inspection : ix\_inspection\_vehicle\_at.

fleet.fine : ix\_fine\_vehicle\_issued\_at, ix\_fine\_driver\_issued\_at. ix\_fine\_unpaid\_vehicle

fleet.accident : ix\_accident\_vehicle\_at, ix\_accident\_severity.

fleet.vehicle\_document : ix\_vehicle\_document\_vehicle\_type, ix\_document\_type, ix\_document\_uploaded\_by\_at

# Poslovna pravila

1. **Jedinstvenost identiteta vozila: vin i registration\_number moraju biti jedinstveni.**
2. **Status vozila (životni ciklus): dozvoljene vrijednosti: active, service, retired, sold.**
   * **Prijelazi: active → service → active/retired, active → sold/retired.**
   * **Vozilo u statusu sold ne smije dobivati nove dodjele, naloge održavanja ni točenja goriva.**
3. **Nenegativne vrijednosti: svi troškovi i količine (litri, cijena, premija…) ≥ 0.**

**Dodjele i rezervacije**

1. **Jedna aktivna dodjela po vozilu: u istom trenutku najviše jedna vehicle\_assignment bez datuma završetka (assigned\_to IS NULL).**
2. **Vozačka dozvola: vozaču kojem istječe dozvola (license\_expiry) nije dopušteno otvoriti novu dodjelu nakon isteka.**
3. **Rezervacije pool vozila:**
   * **reservation u statusu approved ne smije se preklapati po vremenu za isto vozilo.**
   * **Otkazivanje (cancelled) mora imati razlog.**

**Kilometraža i vožnje**

1. **Monotonost očitanja: svako novo odometer\_reading.reading\_km mora biti ≥ prethodnog za isto vozilo.**
2. **Sanity check brzine rasta km: razlika km/dan ne smije prelaziti npr. 1.500 km/dan (flagirati kao anomaliju).**
3. **Trip log ↔ očitanja (ako koristiš trip\_log): zbroj trip\_log.km između dva susjedna očitanja mora otprilike odgovarati razlici odometra (tolerancija npr. ±5%).**

**Gorivo**

1. **Konzistentnost km pri točenju: fuel\_transaction.odometer\_km ≥ zadnje očitanje; za ev gorivo koristi se alternativno polje (npr. energy\_kwh) — ako uvedeš tu varijantu, litri i kWh se međusobno isključuju.**
2. **Anomalije potrošnje: ako je procijenjena potrošnja > 30% odstupanja od prosjeka vozila → označi transakciju kao suspicious.**
3. **Kartica goriva: ako fuel\_card ima assigned\_vehicle\_id, onda su sve transakcije s tom karticom očekivano za to vozilo (inače flag).**

**Održavanje**

1. **Workflow naloga: maintenance\_order.status slijedi dopuštene prijelaze: open → in\_progress → closed ili open → cancelled.**
2. **Zatvaranje naloga: nije dozvoljeno closed ako ne postoji barem jedna maintenance\_item.**
3. **Trošak naloga: total\_cost mora odgovarati zbroju stavki (ili se računa iz stavki — jedan izvor istine).**
4. **Planirani servis: ako koristiš DC plan (npr. svakih 15.000 km / 12 mj.), “uskoro” je ≤ 1.000 km ili ≤ 30 dana do roka.**

**Policije, registracije, tehnički**

1. **Ne-preklapanje razdoblja: insurance\_policy i registration\_record zapisi za isto vozilo ne smiju se preklapati po datumima.**
2. **Datumi valjanosti: valid\_to > valid\_from. Za produženja se kreira novi zapis (povijest je očuvana).**
3. **Tehnički pregled: inspection mora imati result (npr. passed/failed) i datum; failed zahtijeva napomenu.**

**Kazne i nezgode**

1. **Kazna: amount > 0; ako je paid\_at postavljen, bilježi i način plaćanja (tekstualno polje).**
2. **Nezgoda: severity ∈ {minor, major, total}; ako je total, vozilo automatski prelazi u status retired (ili sold nakon otuđenja).**

**Dokumenti**

1. **Dozvoljeni tipovi: vehicle\_document.doc\_type mora biti jedna od vrijednosti iz dc\_document\_type.**
2. **Integritet dokumenata: document.url mora biti važeća putanja/URL; uploaded\_by obavezan; dokument se ne briše ako postoji veza (vehicle\_document), već se označava (soft delete) po potrebi.**

**Auditing i kvalitet**

1. **Audit stupci: created\_at, created\_by, modified\_at, modified\_by na ključnim tablicama.**
2. **Soft delete (po potrebi): is\_deleted umjesto fizičkog brisanja za entitete s poviješću (vehicle, employee, driver, vendor…).**
3. **Indeksi: na česta filtriranja (status, datumi, (vehicle\_id, reading\_at), (vehicle\_id, posted\_at)…).**