Part 2: Database Design

1. **Design Schema (SQL DDL)**

CREATE TABLE companies (  
 id SERIAL PRIMARY KEY,  
 name TEXT NOT NULL  
);  
  
CREATE TABLE warehouses (  
 id SERIAL PRIMARY KEY,  
 company\_id INTEGER REFERENCES companies(id),  
 name TEXT NOT NULL,  
 location TEXT  
);  
  
CREATE TABLE products (  
 id SERIAL PRIMARY KEY,  
 name TEXT NOT NULL,  
 sku TEXT UNIQUE NOT NULL,  
 price DECIMAL(10, 2) NOT NULL,  
 product\_type TEXT DEFAULT 'standard' -- 'standard' or 'bundle'  
);  
  
CREATE TABLE inventories (  
 product\_id INTEGER REFERENCES products(id),  
 warehouse\_id INTEGER REFERENCES warehouses(id),  
 quantity INTEGER NOT NULL DEFAULT 0,  
 PRIMARY KEY (product\_id, warehouse\_id)  
);  
  
CREATE TABLE inventory\_logs (  
 id SERIAL PRIMARY KEY,  
 product\_id INTEGER REFERENCES products(id),  
 warehouse\_id INTEGER REFERENCES warehouses(id),  
 change INTEGER NOT NULL,  
 reason TEXT,  
 created\_at TIMESTAMP DEFAULT CURRENT\_TIMESTAMP  
);  
  
CREATE TABLE suppliers (  
 id SERIAL PRIMARY KEY,  
 name TEXT NOT NULL,  
 contact\_email TEXT  
);  
  
CREATE TABLE product\_suppliers (  
 product\_id INTEGER REFERENCES products(id),  
 supplier\_id INTEGER REFERENCES suppliers(id),  
 PRIMARY KEY (product\_id, supplier\_id)  
);  
  
CREATE TABLE product\_bundles (  
 bundle\_id INTEGER REFERENCES products(id),  
 component\_id INTEGER REFERENCES products(id),  
 quantity INTEGER NOT NULL,  
 PRIMARY KEY (bundle\_id, component\_id)  
);

**2. Identify Gaps**

- Should low-stock thresholds be global per product or specific to each warehouse?

- Are inventory changes only for manual updates, or do sales, returns, and transfers also count?

- Do we need to track inventory reserved for orders separately from available stock?

- Should a bundle have its own inventory, or is it always computed from its components?

- Can a warehouse be shared across companies?

- Do we need precise warehouse locations (address, GPS)?

- Should the supplier-product relationship include lead time or cost?

- Can products have multiple suppliers with different conditions?

- Should products support categories, units, or barcodes?

- Should products belong to a company or be global?

- Do we need to track which user performed inventory changes?

- Should we use soft deletes or permanent deletes for items?

**3.Explain Decisions**

- Used foreign keys to ensure referential integrity between related tables (e.g., products, warehouses).

- Used composite primary keys in `inventories` and `product\_suppliers` to prevent duplicates.

- Added `inventory\_logs` table for auditability and historical tracking of inventory changes.

- Used `product\_type` field to differentiate between standard and bundle products.

- Normalized schema to keep suppliers and products decoupled, enabling many-to-many relationships.

- Chose `DECIMAL` for price to avoid floating-point rounding errors.

- Indexes are automatically created on primary and foreign keys for performance.

- Schema is modular and easy to extend (e.g., for units, categories, or advanced inventory tracking).