# CacheNCarry

**Where "left behind" meets `LEFT JOIN`.**

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CacheNCarry is an end-of-semester storage management system designed to track and manage student belongings (cloakroom luggage + a mattress). The system ensures easy check-in/check-out processes, reduces human error, and provides traceability for checked-in bags and misplaced mattresses.

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## Flow

### 1. Student Registration:

At the end of each semester, a `student` registers their `belonging(s)`:

- Belongings can be of two types: `luggage` or `mattress`.
- Each item is assigned a unique `UUID`.
- A QR code is generated for each item and must be printed and physically attached to the respective belonging by the student.

### 2. Item Check-In:

At the warehouse:

- A `staff` member scans a QR code on the student's phone to begin a `session`, associating the session with that student, and logging check-in time.
- The QR codes on each belonging are scanned to link them to the student and register them into the system.
- The staff ends the session once all items have been scanned.

### 3. Storage Period:

- Belongings remain in the warehouse during the student's absence.
- Mattresses are handled separately: at the start of the semester, they are moved directly to student rooms by university workers.

### 4. Item Retrieval (Check-Out):

Upon the student's return:

- The student visits the warehouse.
- Staff scan the student’s QR code to open a check-out session.
- For each item:
  - **Luggage**: The system validates whether the scanned luggage belongs to the student in session. If ownership does not match, the item cannot be checked out.
  - **Mattress**: Since the mattress is already placed in the student’s room, the staff scan both the student and the mattress QR code to validate ownership.

- The staff ends the session once all items have been scanned.

### 5. Misplacement Handling:

If a scanned mattress does not belong to the student:

- An `incident` is opened.
- Because all mattresses are uniquely tagged and linked to their rightful owners, it can be easily determined:
  - Who the mattress actually belongs to.
  - Who mistakenly received another student's mattress.
- This allows staff to resolve such incidents efficiently without manual investigation.

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## 🔧 Tech stack

- **Frontend & API**: SvelteKit + TailwindCSS
- **Database**: MySQL
- **DB Connector**: Prisma
- **Containerization**: Docker

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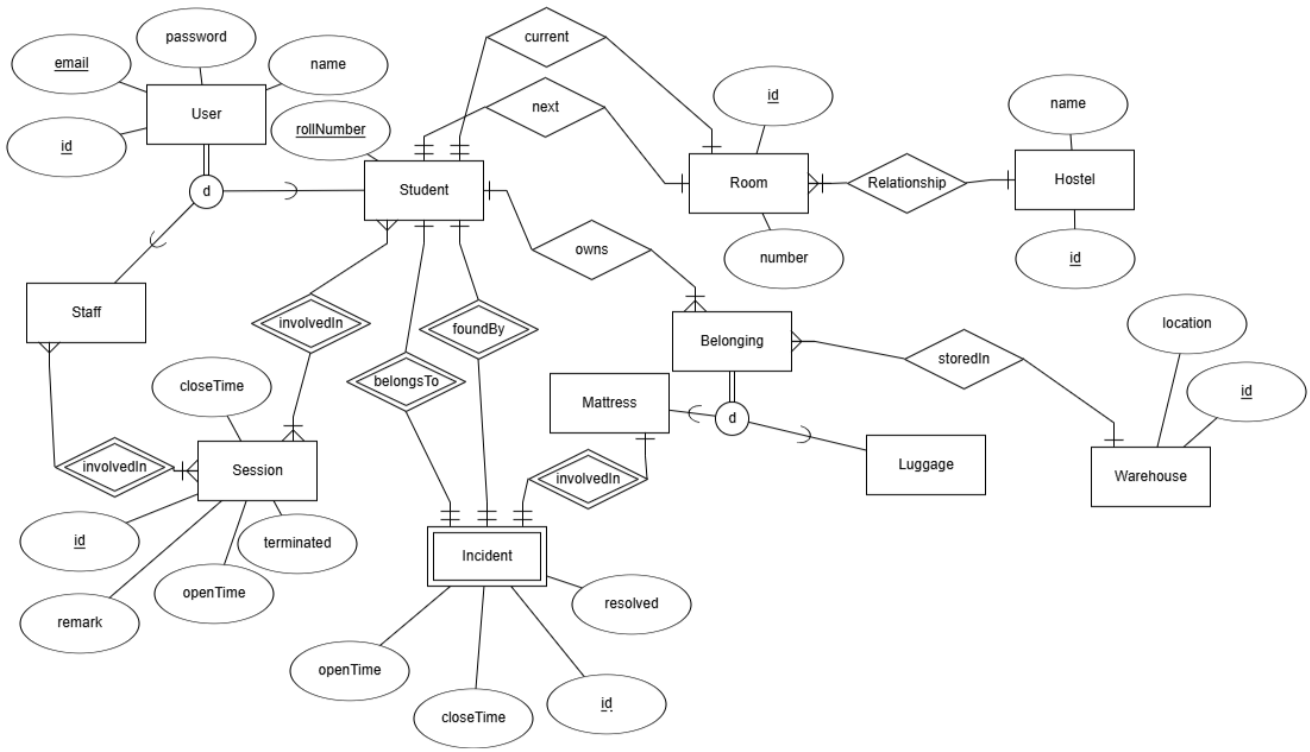
## 🖊 Entity Relationship Diagram

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## 📋 Schema Overview

## Entities

### `user`

All students and staff register as `users`.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY | `UUID` identification for user |
| `name` | VARCHAR(191) | | user's real name |
| `email` | VARCHAR(191) | UNIQUE | unique organization email id |
| `password` | VARCHAR(191) | UNIQUE | hashed password |

### `staff`

A `staff` member oversees sessions and incidents.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY, FOREIGN KEY (`user.id`) | `UUID` identification for staff corressponding to user |

### `student`

A `student` can register their items and check them in with QR codes attached to them.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY, FOREIGN KEY (`user.id`) | `UUID` identification for student corressponding to user |
| `roll_number` | VARCHAR(12) | UNIQUE | unique roll number |
| `current_room_id` | VARCHAR(191) | FOREIGN KEY (`room.id`) | `UUID` identification of current occupancy |
| `next_room_id` | VARCHAR(191) | FOREIGN KEY (`room.id`), NULLABLE | `UUID` identification of next occupancy |

### `hostel`

A `hostel` is a place of residence containing rooms.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY | `UUID` identification for hostel |
| `name` | VARCHAR(191) | PRIMARY KEY | name of the hostel |

### `room`

Represents a `room` within a hostel.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY | `UUID` identification for a room |
| `number` | VARCHAR(6) | UNIQUE per hostel (`hostel_id`, `number`) | hostel room number |
| `hostel_id` | VARCHAR(191) | FOREIGN KEY (`hostel.id`) | `UUID` identification for the corressponding hostel |

### `warehouse`

A `warehouse` is a physical storage unit for student belingings.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | VARCHAR(191) | PRIMARY KEY | `UUID` identification for a warehouse |
| `location` | VARCHAR(191) | | information about general location |

### `belonging`

A `belonging` is a general entity for storable items.

| Field | Type | Constraints | Description |
|---|---|---|---|
| `id` | INTEGER | PRIMARY KEY | `UUID` identification for each belonging |
| `description` | VARCHAR(191) | NULLABLE | general description of the item |
| `is_checked_in` | BOOLEAN | DEFAULT FALSE | indication of whether the item is checked in |
| `checked_in_at` | DATETIME | NULLABLE | timestamp for when the item was checked in |
| `checked_out_at` | DATETIME | NULLABLE | timestamp for when the item was checked out |
| `student_id` | VARCHAR(191) | FOREIGN KEY (`student.id`) | `UUID` identification for the owning student |
| `warehouse_id` | VARCHAR(191) | FOREIGN KEY (`warehouse.id`), NULLABLE | `UUID` identification for the storage warehouse |

### `luggage`

Student `luggage` that can be checked in and out in direct sessions.

| Field | Type | Constraints | Description |
|---|---|---|---|

| Field | Type | Constraints | Description |
|---|---|---|---|
| id | VARCHAR(191) | PRIMARY KEY, FOREIGN KEY (belonging.id) | UUID identification for each bag |

### mattress

A mattress can be stored over the semester break, and gets transported to a student's room before they arrive. An ownership discrepancy leads to an incident.

| Field | Type | Constraints | Description |
|---|---|---|---|
| id | VARCHAR(191) | PRIMARY KEY, FOREIGN KEY (belonging.id) | UUID identification for a mattress |

### session

Represents a warehouse interaction involving a student and staff member.

| Field | Type | Constraints | Description |
|---|---|---|---|
| id | VARCHAR(191) | PRIMARY KEY | UUID identification for each session |
| remark | VARCHAR(191) | NULLABLE | Optional notes about the session |
| open_time | DATETIME | DEFAULT NOW() | timestamp for when the session started. |
| close_time | DATETIME | NULLABLE | timestamp for when the session ended. |
| terminated | BOOLEAN | DEFAULT FALSE | indication of whether the session was manually terminated. |
| staff_id | VARCHAR(191) | FOREIGN KEY (staff.id) | UUID identification for the staff member managing the session |
| student_id | VARCHAR(191) | FOREIGN KEY (student.id), UNIQUE per staff (staff_id, student_id) | UUID identification for the student who owns the belongings |

### incident

Represents misplacement or ownership conflict involving mattresses.

| Field | Type | Constraints | Description |
|---|---|---|---|
| id | VARCHAR(191) | PRIMARY KEY | UUID identification for each incident. |

| Field | Type | Constraints | Description |
|---|---|---|---|
| `mattress_id` | VARCHAR(191) | FOREIGN KEY (`mattress.id`) | `UUID` identification for the mattress involved in the incident. |
| `found_by` | VARCHAR(191) | FOREIGN KEY (`student.id`) | `UUID` identification for the student who discovered the misplaced mattress. |
| `belongs_to` | VARCHAR(191) | FOREIGN KEY (`student.id`) | `UUID` identification for the student to whom the mattress actually belongs. |
| `resolved` | BOOLEAN | DEFAULT FALSE | indication of whether the incident has been resolved. |
| `open_time` | DATETIME | DEFAULT `NOW()` | timestamp for when the incident was reported. |
| `close_time` | DATETIME | NULLABLE | timestamp for when the incident was resolved. |

## Constraints

| Table | Foreign Key | References | On Delete | On Update |
|---|---|---|---|---|
| `staff` | `id` | `user(id)` | CASCADE | CASCADE |
| `student` | `id` | `user(id)` | CASCADE | CASCADE |
| `student` | `current_room_id` | `room(id)` | RESTRICT | CASCADE |
| `student` | `next_room_id` | `room(id)` | SET NULL | CASCADE |
| `room` | `hostel_id` | `hostel(id)` | CASCADE | CASCADE |
| `belonging` | `student_id` | `student(id)` | RESTRICT | CASCADE |
| `belonging` | `warehouse_id` | `warehouse(id)` | SET NULL | CASCADE |
| `luggage` | `id` | `belonging(id)` | CASCADE | CASCADE |
| `mattress` | `id` | `belonging(id)` | CASCADE | CASCADE |
| `session` | `staff_id` | `staff(id)` | RESTRICT | CASCADE |
| `session` | `student_id` | `student(id)` | RESTRICT | CASCADE |
| `incident` | `mattress_id` | `mattress(id)` | RESTRICT | CASCADE |
| `incident` | `found_by` | `student(id)` | RESTRICT | CASCADE |
| `incident` | `belongs_to` | `student(id)` | RESTRICT | CASCADE |

## Database Normalization

The following is a concise normalization analysis for each table:

### `user`

```
CREATE TABLE `user` (
    `id` VARCHAR(191) NOT NULL,
    `name` VARCHAR(191) NOT NULL,
    `email` VARCHAR(191) NOT NULL,
    `password` VARCHAR(191) NOT NULL,

    UNIQUE INDEX `user_email_key`(`email`),
    PRIMARY KEY (`id`)
)
```

- **1NF**: All attributes atomic
- **2NF**: All non-key attributes depend on full `PRIMARY KEY` (`id`)
- **3NF**: No transitive dependencies

### staff

```
CREATE TABLE `staff` (
    `id` VARCHAR(191) NOT NULL,

    PRIMARY KEY (`id`)
)
```

- **1NF**: Minimal table structure
- **2NF**: Inherits `PRIMARY KEY` from `user` (no partial dependencies)
- **3NF**: No non-key dependencies

### student

```
CREATE TABLE `student` (
    `id` VARCHAR(191) NOT NULL,
    `rollNumber` VARCHAR(12) NOT NULL,
    `current_room_id` VARCHAR(191) NOT NULL,
    `next_room_id` VARCHAR(191) NULL,

    UNIQUE INDEX `student_rollNumber_key`(`rollNumber`),
    UNIQUE INDEX `student_current_room_id_key`(`current_room_id`),
    UNIQUE INDEX `student_next_room_id_key`(`next_room_id`),
    PRIMARY KEY (`id`)
)
```

- **1NF**: Atomic values
- **2NF**: `roll_number` depends on full `PRIMARY KEY`
- **3NF**: `room` references are ID-only (no transitive dependencies)

### hostel

```
CREATE TABLE `hostel` (
    `id` VARCHAR(191) NOT NULL,
    `name` VARCHAR(191) NOT NULL,

    PRIMARY KEY (`id`)
)
```

- **1NF**: Simple structure
- **2NF**: Single attribute depends on `PRIMARY KEY`
- **3NF**: No non-key dependencies

### `room`

```
CREATE TABLE `room` (
    `id` VARCHAR(191) NOT NULL,
    `number` VARCHAR(6) NOT NULL,
    `hostel_id` VARCHAR(191) NOT NULL,

    UNIQUE INDEX `room_hostel_id_number_key`(`hostel_id`, `number`),
    PRIMARY KEY (`id`)
)
```

- **1NF**: Proper identifiers
- **2NF**: Composite unique key (`hostel_id` + `number`) depends on `PRIMARY KEY`
- **3NF**: No derived attributes

### `warehouse`

```
CREATE TABLE `warehouse` (
    `id` VARCHAR(191) NOT NULL,
    `location` VARCHAR(191) NOT NULL,

    PRIMARY KEY (`id`)
)
```

- **1NF**: Basic table
- **2NF**: Single non-key attribute
- **3NF**: No dependencies

### `belonging`

```
CREATE TABLE `belonging` (
    `id` VARCHAR(191) NOT NULL,
    `description` VARCHAR(191) NULL,
    `is_checked_in` BOOLEAN NOT NULL DEFAULT false,
```

```
    `student_id` VARCHAR(191) NOT NULL,
    `warehouse_id` VARCHAR(191) NULL,
    `checked_in_at` DATETIME(3) NULL,
    `checked_out_at` DATETIME(3) NULL,

    PRIMARY KEY (`id`)
)
```

- **1NF**: Atomic fields
- **2NF**: All attributes depend on `PRIMARY KEY`
- **3NF**: `warehouse` reference is ID-only

### `luggage/mattress`

```
CREATE TABLE `luggage` (
    `id` VARCHAR(191) NOT NULL,

    PRIMARY KEY (`id`)
)

CREATE TABLE `mattress` (
    `id` VARCHAR(191) NOT NULL,

    PRIMARY KEY (`id`)
)
```

- **1NF**: Inherited `PRIMARY KEY`
- **2NF**: No additional attributes
- **3NF**: Inherited normalization from `belonging`

### `session`

```
CREATE TABLE `session` (
    `id` VARCHAR(191) NOT NULL,
    `remark` VARCHAR(191) NULL,
    `open_time` DATETIME(3) NOT NULL DEFAULT CURRENT_TIMESTAMP(3),
    `close_time` DATETIME(3) NULL,
    `terminated` BOOLEAN NOT NULL DEFAULT false,
    `staff_id` VARCHAR(191) NOT NULL,
    `student_id` VARCHAR(191) NOT NULL,

    UNIQUE INDEX `session_staff_id_student_id_key`(`staff_id`, `student_id`),
    PRIMARY KEY (`id`)
)
```

- **1NF**: Proper structure
- **2NF**: All attributes depend on `PRIMARY KEY`

- **3NF**: `staff`/`student` references are ID-only

### `incident`

```
CREATE TABLE `incident` (
    `id` VARCHAR(191) NOT NULL,
    `found_by` VARCHAR(191) NOT NULL,
    `belongs_to` VARCHAR(191) NOT NULL,
    `mattress_id` VARCHAR(191) NOT NULL,
    `resolved` BOOLEAN NOT NULL DEFAULT false,
    `open_time` DATETIME(3) NOT NULL DEFAULT CURRENT_TIMESTAMP(3),
    `close_time` DATETIME(3) NULL,

    UNIQUE INDEX `incident_found_by_key`(`found_by`),
    UNIQUE INDEX `incident_belongs_to_key`(`belongs_to`),
    UNIQUE INDEX `incident_mattress_id_key`(`mattress_id`),
    PRIMARY KEY (`id`)
)
```

- **1NF**: Atomic values
- **2NF**: All fields relate to `PRIMARY KEY`
- **3NF**: `mattress`/`student` references are ID-only

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## Trigger Deep Dive

### `belonging_checkin_log`

```
CREATE TRIGGER belonging_checkin_log
    BEFORE UPDATE ON belonging
    FOR EACH ROW
        BEGIN
            IF OLD.is_checked_in = FALSE AND NEW.is_checked_in = TRUE THEN
                SET NEW.checked_in_at = NOW();
            END IF;
        END;
```

**Logic**:

- WHEN: `is_checked_in` changes false → true
- WHAT: Sets `checked_in_at` to current timestamp
- WHY: Logging check-in request time

### `belonging_checkout_log`

```
CREATE TRIGGER belonging_checkout_log
    BEFORE UPDATE ON belonging
```

```
    FOR EACH ROW
        BEGIN
            IF OLD.is_checked_in = TRUE AND NEW.is_checked_in = FALSE THEN
                SET NEW.checked_out_at = NOW();
            END IF;
        END;
```

**Logic**:

- WHEN: `is_checked_in` changes true → false
- WHAT: Sets `checked_out_at` to current timestamp
- WHY: Logging check-out request time

### `session_log`

```
CREATE TRIGGER session_log
            BEFORE UPDATE ON session
            FOR EACH ROW
                BEGIN
                    IF OLD.terminated = FALSE AND NEW.terminated = TRUE THEN
                        SET NEW.close_time = NOW();
                    END IF;
                END;
```

**Logic**:

- WHEN: `terminated` changes false → true
- WHAT: Sets `close_time` to current timestamp
- WHY: Logging session close time

### `incident_log`

```
CREATE TRIGGER incident_log
            BEFORE UPDATE ON incident
            FOR EACH ROW
                BEGIN
                    IF OLD.resolved = FALSE AND NEW.resolved = TRUE THEN
                        SET NEW.close_time = NOW();
                    END IF;
                END;
```

**Logic**:

- WHEN: `resolved` changes false → true
- WHAT: Sets `close_time` to current timestamp
- WHY: Logging incident close time