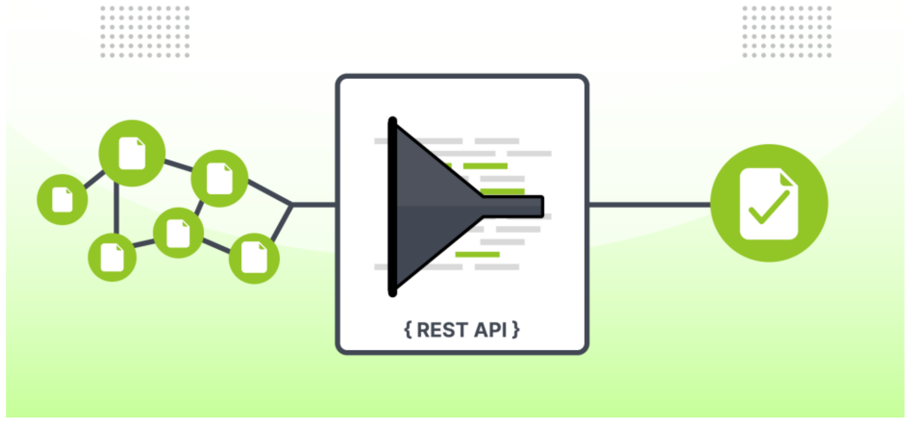
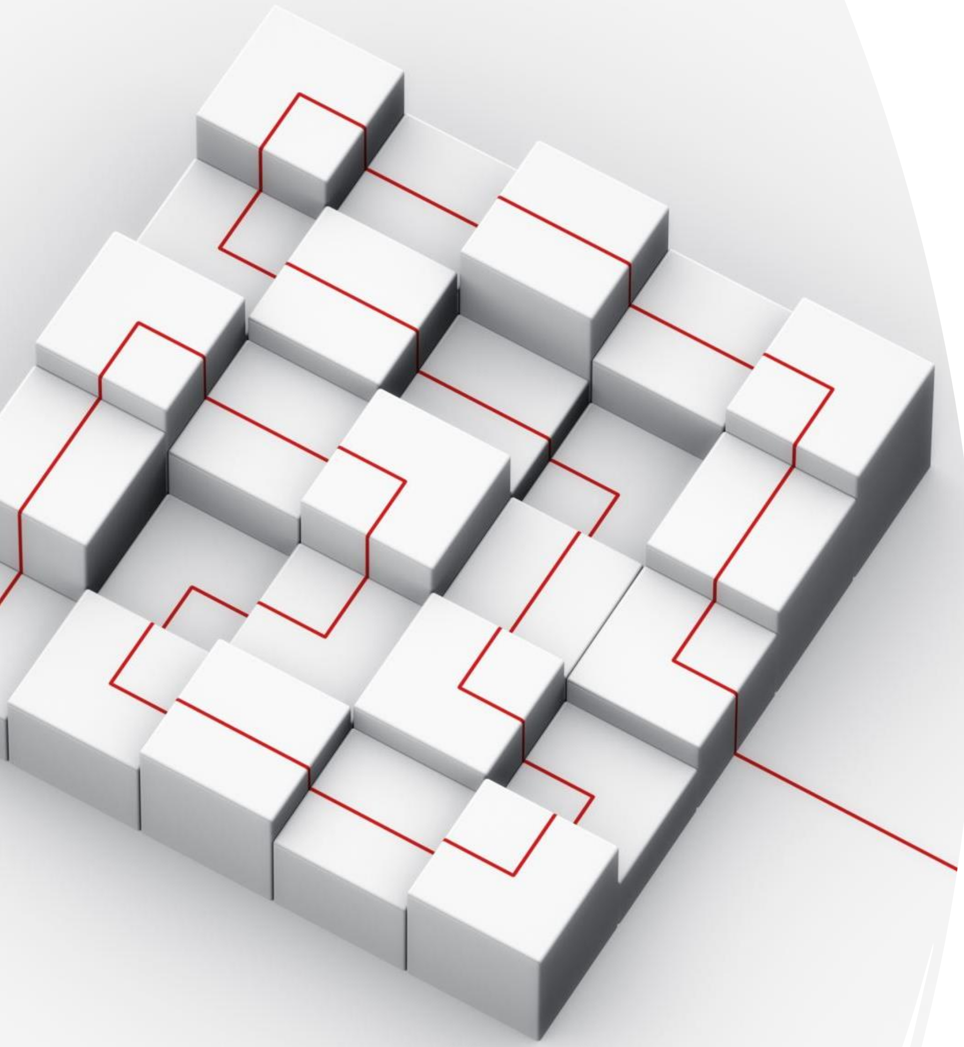
INT 161

Basic Backend Development

Filtering and Sorting

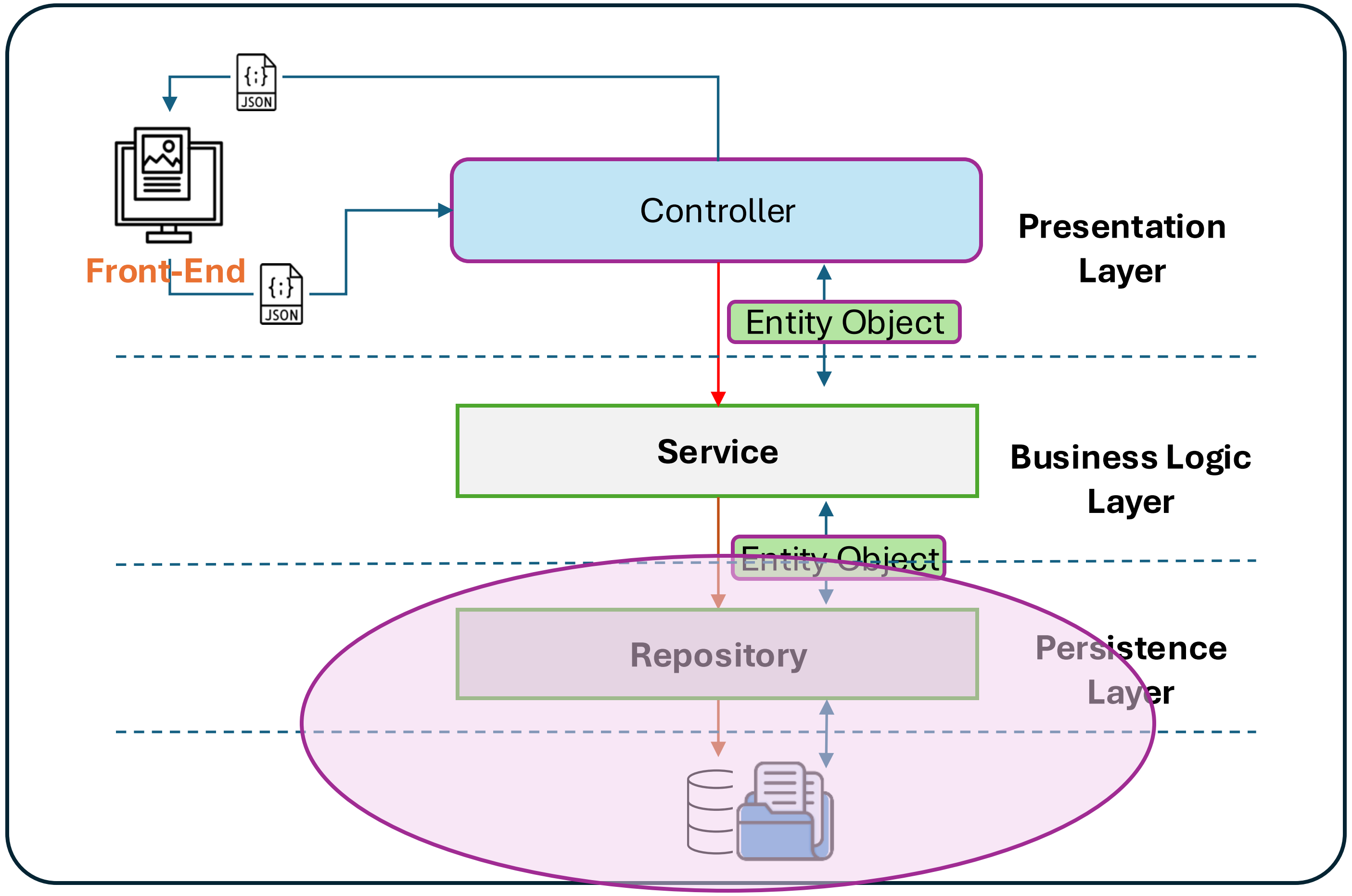




Unit Objectives

- After completing this unit, you should be able to:
  - Understand basic concept of Sorting and Filtering
  - Using Prisma Data Modelling for Sorting and Filtering

Layered System

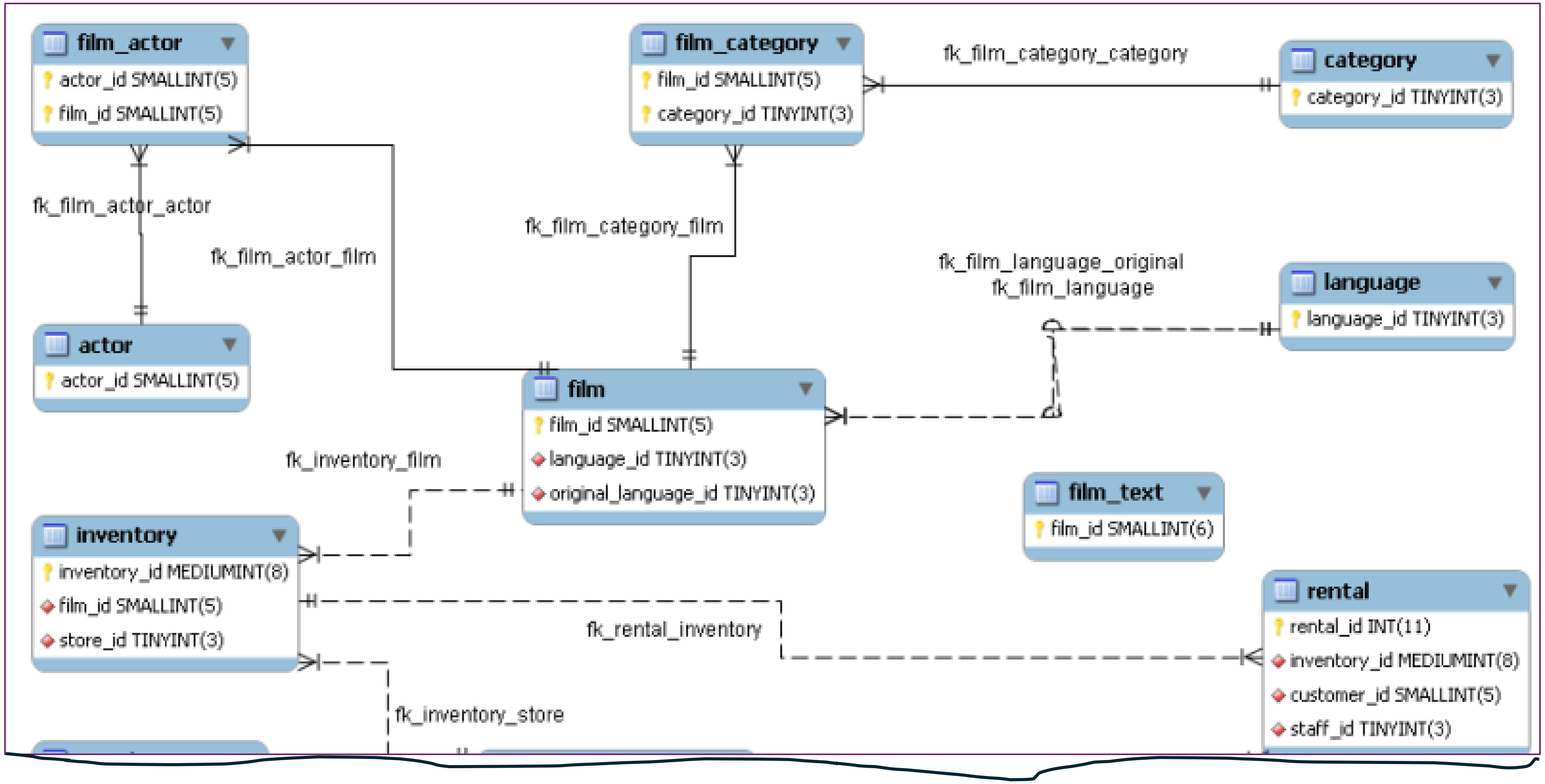


The **Layered System** principle means that a REST API is designed as a set of layers, where each layer has a specific role, and a client does not need to know whether it's communicating directly with the end server or through intermediaries.

This allows **scalability, flexibility, and separation of concerns**.

https://dev.mysql.com/doc/sakila/en/sakila-structure.html

Sakila



Prisma CRUD summary - Read

Method	Description	Example

findUnique()	Fetches a single, unique record by a unique identifier, like id or email.	await prisma.user.findUnique({
		    where: { id: 1, }
		});

findFirst()	Fetches the first record matching the search criteria.	await prisma.user.findFirst({
		    where: { name: 'Alice', }
		});

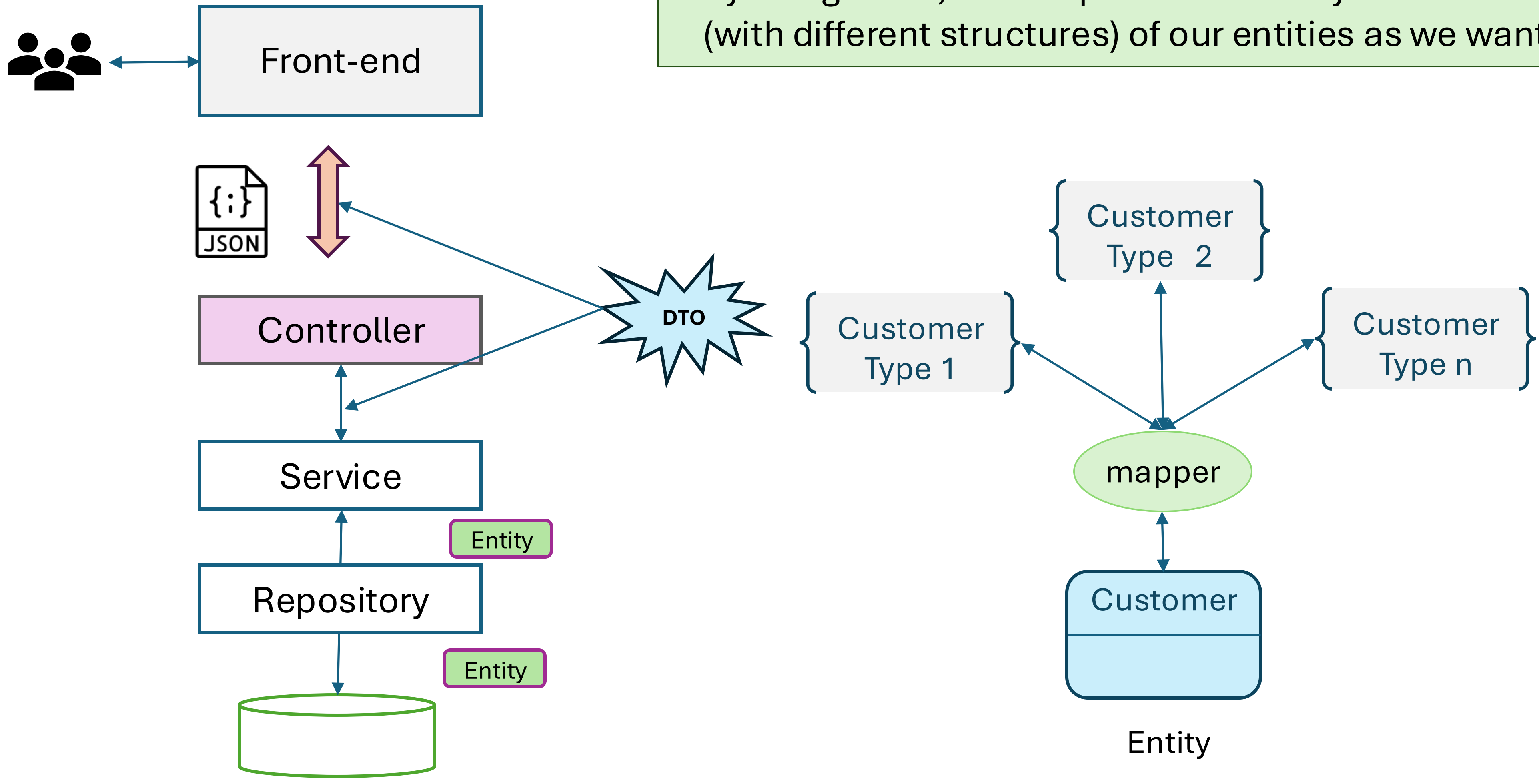
findMany()	Fetches all records matching the search criteria.	// Find all users
		await prisma.user.findMany();
		// Find users with a specific name await
		prisma.user.findMany({
		    where: { name: 'Alice', }
		});

Prisma Data Modelling (1:m, m:1 relationship)

```
model City {
  id          Int       @id @default(autoincrement()) @db.UnsignedSmallInt @map("city_id")
  city        String    @db.VarChar(50)
  countryId   Int       @map("country_id") @db.UnsignedSmallInt
  lastUpdate  DateTime  @default(now()) @db.Timestamp(0) @map("last_update")
  addresses   Address[]
  country     Country   @relation(fields: [countryId], references: [id]
                        , map: "fk_city_country")

  @@index([id], map: "idx_fk_country_id")
  @@map("city")
}

model Country {
  id          Int      @id @default(autoincrement()) @db.UnsignedSmallInt @map("country_id")
  country     String   @db.VarChar(50)
  lastUpdate  DateTime @default(now()) @map("last_update") @db.Timestamp(0)
  cities      City[]

  @@map("country")
}
```

DTO: Data Transfer Object

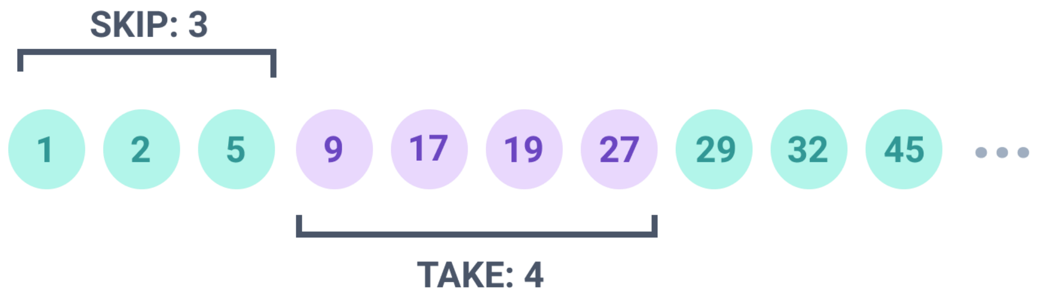
- The data is mapped from the domain models to the DTOs.
- By using DTOs, we can provide as many different versions (with different structures) of our entities as we want.



Prisma Pagination

- Prisma Client supports both offset pagination and cursor-based pagination.
- Offset pagination
  - Offset pagination uses skip and take to skip a certain number of results and select a limited range.
  - The following query skips the first 3 Customer records and returns records 4 - 7:

```
const results = await prisma.customer.findMany({
  skip: 3,
  take: 4,
})
```



- To implement pages of results, you would just skip the number of pages multiplied by the number of results you show per page.

Offset pagination Example

```
const data = await
prisma.customer.findMany({
    skip: (page - 1) * pageSize,
    take: pageSize,
    orderBy: sortBy,
    include: {
        address: includeAddress ? {
            include: {
                city: {
                    include: {
                        country: true
                    }
                },
            }
        } : false,
    },
```

page	pageSize	skip	take
1	10	0	1-10
2	10	10	11-20
3	10	20	21-30
9	10	80	81-90

Film Data (1)

```
model Actor {
  actor_id    Int          @id @default(autoincrement()) @db.UnsignedSmallInt
  first_name  String       @db.VarChar(45)
  last_name   String       @db.VarChar(45)
  last_update DateTime     @default(now()) @db.Timestamp(0)
  film_actor  FilmActor[]

  @@index([last_name], map: "idx_actor_last_name")
}

model Category {
  category_id   Int            @id @default(autoincrement()) @db.UnsignedTinyInt
  name          String         @db.VarChar(25)
  last_update   DateTime       @default(now()) @db.Timestamp(0)
  film_category FilmCategory[]
}
```

Film Data (2)

```
model Film {
  id                   Int            @id @default(autoincrement())
                                      @db.UnsignedSmallInt @map("film_id")
  title                String         @db.VarChar(128)
  description          String?        @db.Text
  release_year         Int?           @db.Year
  language_id          Int            @db.UnsignedTinyInt
  original_language_id Int?           @db.UnsignedTinyInt
  rental_duration      Int            @default(3) @db.UnsignedTinyInt
  rental_rate          Decimal        @default(4.99) @db.Decimal(4, 2)
  length               Int?           @db.UnsignedSmallInt
  replacement_cost     Decimal        @default(19.99) @db.Decimal(5, 2)
  rating               FilmRating?    @default(G)
  special_features     String?
  last_update          DateTime       @default(now()) @db.Timestamp(0)
  film_actor           FilmActor[]
  film_category        FilmCategory[]

  @@index([language_id], map: "idx_fk_language_id")
  @@index([original_language_id], map: "idx_fk_original_language_id")
  @@index([title], map: "idx_title")
}
```

```
enum FilmRating {
  G
  PG
  PG_13 @map("PG-13")
  R
  NC_17 @map("NC-17")
}
```

Film Data (3)

```
model FilmActor {
  actor_id    Int      @db.UnsignedSmallInt
  film_id     Int      @db.UnsignedSmallInt
  last_update DateTime @default(now()) @db.Timestamp(0)
  actor       Actor    @relation(fields: [actor_id], references: [actor_id],
                        map: "fk_film_actor_actor")
  film        Film     @relation(fields: [film_id], references: [id],
                        map: "fk_film_actor_film")


  @@id([actor_id, film_id])
  @@index([film_id], map: "idx_fk_film_id")
  @@map("film_actor")
}
```

Film Data (4)

```
model FilmCategory {
  film_id     Int      @db.UnsignedSmallInt
  category_id Int      @db.UnsignedTinyInt
  last_update DateTime @default(now()) @db.Timestamp(0)
  category    Category @relation(fields: [category_id], references: [category_id],
                        map: "fk_film_category_category")
  film        Film     @relation(fields: [film_id], references: [id],
                       map: "fk_film_category_film")


  @@id([film_id, category_id])
  @@index([category_id], map: "fk_film_category_category")
  @@map("film_category")
}
```

Prisma: Filtering and Sorting

- Prisma Client supports:
  - Filtering with the where query option,
  - Sorting with the orderBy query option.

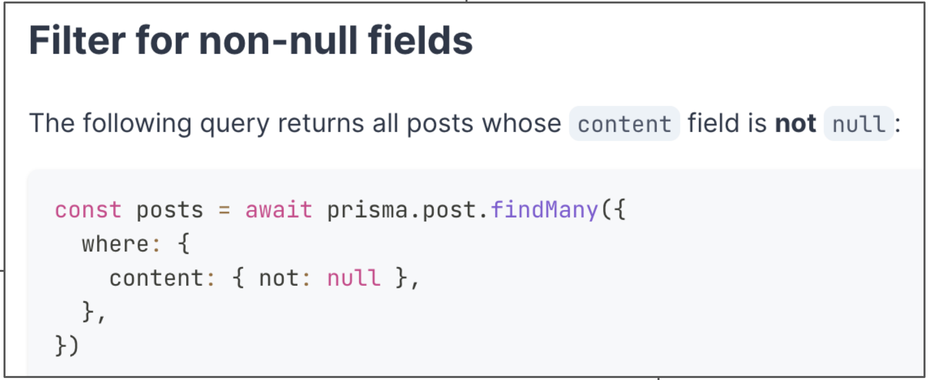
```
const users = await prisma.user.findMany({
    where: {
        email: {
            endsWith: '@example.com',
        },
    },
    orderBy: {
        name: 'asc', // Sort by name in ascending order
    },
});
```

String Filters

- equals → ค่าตรงกัน
- contains → มีข้อความที่กำหนดอยู่ภายใน
- startsWith → ขึ้นต้นด้วย
- endsWith → ลงท้ายด้วย
- in → อยู่ใน list
- notIn → ไม่อยู่ใน list
- mode → ระบุการเปรียบเทียบ case (default หรือ "insensitive")
  - ใช้กับ MySql ที่ไม่ได้ setting ให้รองรับ case sensitive อาจจะมี error เนื่องจาก MySql มี mode เป็น insensitive โดย default

String Filters: example

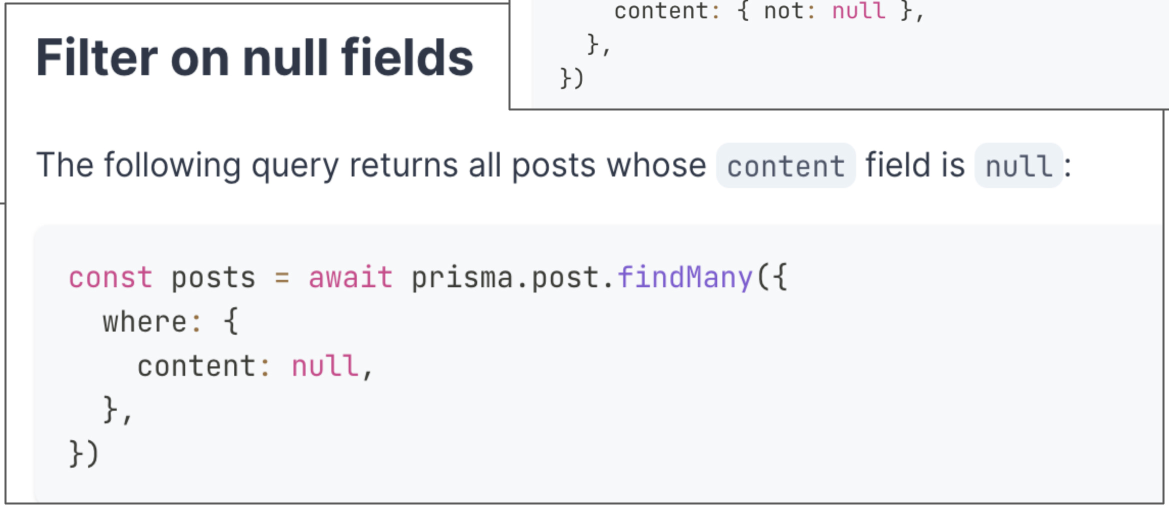
```
const result = await prisma.user.findMany({
  where: {
    OR: [
      { email: {endsWith: 'gmail.com’,} , },
      { email: { endsWith: 'company.com' } },
    ],
    NOT: {
      email: {
        endsWith: 'admin.company.com’,
      },
    },
  },
})
```



Filter for non-null fields

The following query returns all posts whose `content` field is **not** `null`:

```
const posts = await prisma.post.findMany({
  where: {
    content: { not: null },
  },
})
```



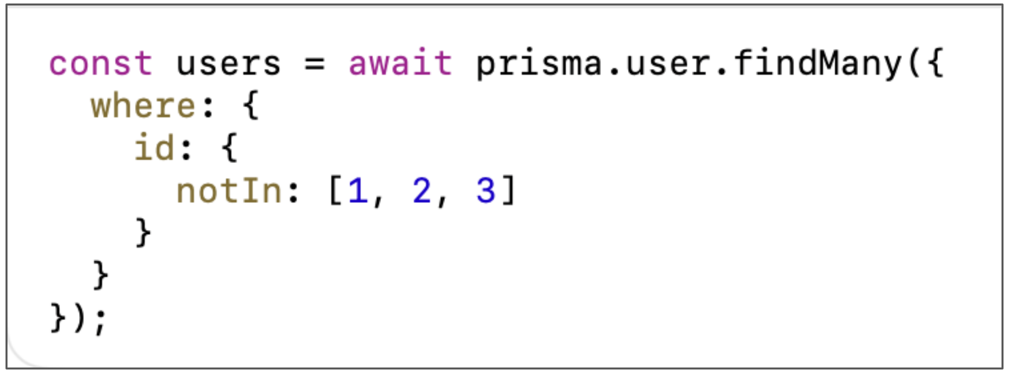
Filter on null fields

The following query returns all posts whose `content` field is `null`:

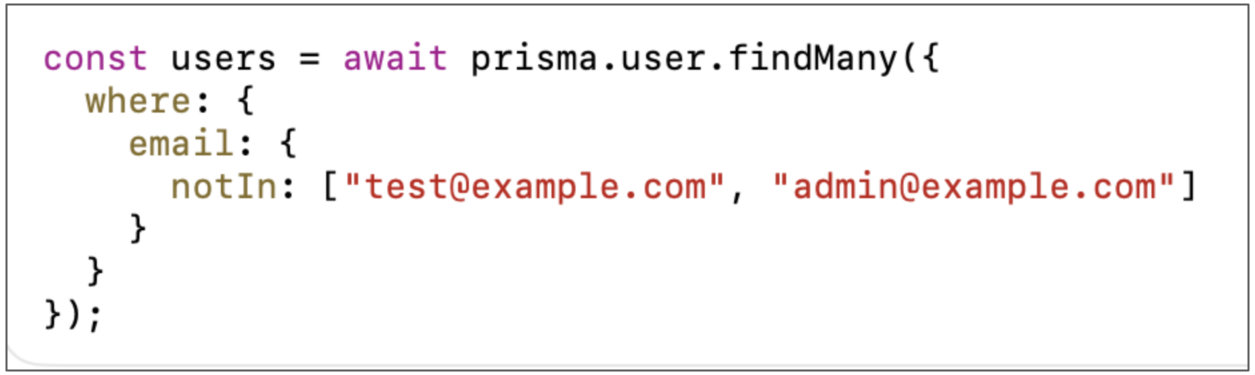
```
const posts = await prisma.post.findMany({
  where: {
    content: null,
  },
})
```

Number / BigInt / Decimal / DateTime Filters

- equals
- in / notIn
- lt (Less than)
- lte (Less than or equals)
- gt (Greater than)
- gte (Greater than or equals)
- not



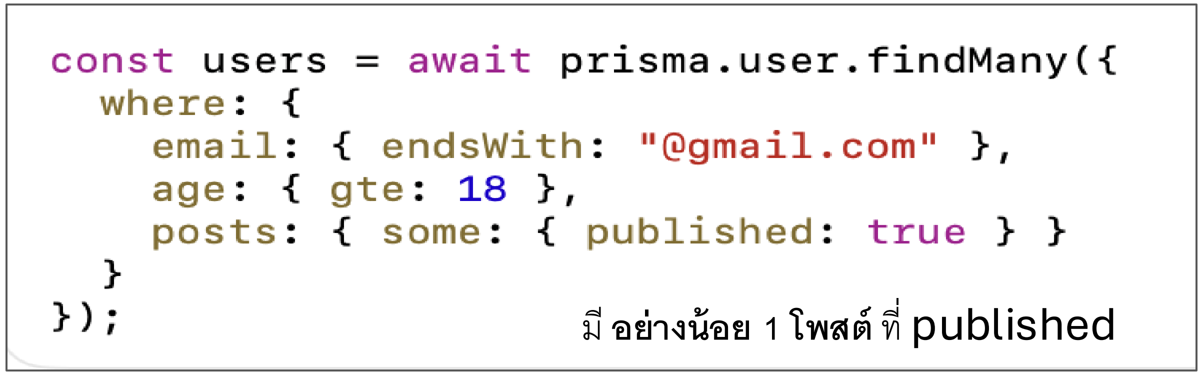
```
const users = await prisma.user.findMany({
  where: {
    id: {
      notIn: [1, 2, 3]
    }
  }
});
```



```
const users = await prisma.user.findMany({
  where: {
    email: {
      notIn: ["test@example.com", "admin@example.com"]
    }
  }
});
```

Boolean / Relation Filters

- Boolean
  - equals: true | false
- Relation Filters
  - some → มีบาง record ที่ match
  - every → ทุก record ต้อง match
  - none → ไม่มี record ไหน match



```
const users = await prisma.user.findMany({
  where: {
    email: { endsWith: "@gmail.com" },
    age: { gte: 18 },
    posts: { some: { published: true } }
  }
});
```

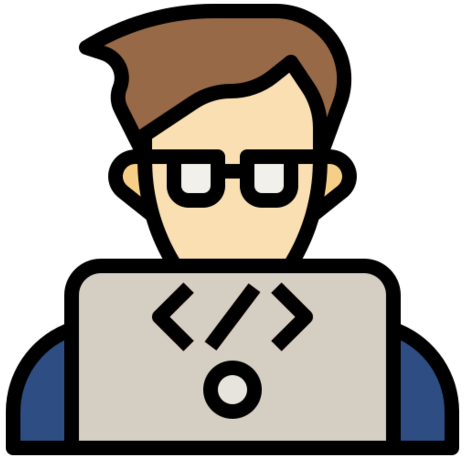
มี อย่างน้อย 1 โพสต์ ที่ published

Sorting

- Use orderBy to sort a list of records or a nested list of records by a particular field or set of fields.

```
const usersWithPosts = await prisma.user.findMany({
 orderBy: [
   { role: 'desc’},
   { name: 'desc’},
 ],
 include: {
   posts: {
     orderBy: {
      title: 'desc’,
     },
   },
 } ,
})
```

Practices



Film Repository : `film-repository.js`

```
const {PrismaClient} = require("../generated/prisma");
const prisma = new PrismaClient();
module.exports = {
   findAll: async function (includeActor = false, pageRequet = {page: 1, pageSize: 10}) {
      const {page, pageSize} = pageRequet;
      const totalItems = await prisma.film.count();
      const data = await prisma.film.findMany({
         skip: (page - 1) * pageSize,
         take: pageSize,
         include: {
            film_actor: includeActor ? {include: {actor: true}} : false,
         },
      });
      return {
         data: data,
         page: page,
         pageSize: pageSize,
         totalItems: totalItems,
         totalPages: Math.ceil(totalItems / pageSize),
      }
   },
```

```
findById: async function (fid) {
      return await prisma.film.findUnique({
         where: {id: fid},
         include: {
            film_actor: {include: {actor: true}},
            film_category: {include: {category: true}},
         },});},
}
```

Film Server : `film-service.js`

```
const repo = require('../repositories/film-repository');

module.exports = {
    getAll: async function (includeActor = false, pageRequest = {}) {
        const results = await repo.findAll(includeActor, pageRequest);
        return results;
    },
    getById: async function (id) {
        const uniqueOne = await repo.findById(id);
        if (!uniqueOne) {
            const err = new Error(`Film not found for ID ${id}`);
            err.code = 'NOT_FOUND';
            err.status = 404;
            throw err;
        }
        return uniqueOne;
    },
}
```

Film DTO (1/4) : `simple-film-dto.js`

```
class SimpleFilmDto {
   constructor(film = {}) {
      const {id, title, release_year, rating, film_actor, film_category} = film;
      this.id = id ?? null;
      this.title = title ?? '-';
      this.releaseYear = release_year ?? '-';
      this.rating = rating ?? '-';
      if (film_actor) {
         this.actors = film_actor.map(actor => {
            return {
               id: actor.actor_id,
               name: actor.actor.first_name.charAt(0) + actor.actor.first_name.slice(1).toLowerCase()
                  + ' ' + actor.actor.last_name.charAt(0)+ actor.actor.last_name.slice(1).toLowerCase()
            }
         });
      }
```

Film DTO (2/4) : `simple-film-dto.js`

```
 if (film_category) {
           this.categories = film_category.map(category => {
              return {
                 id: category.category_id,
                 name: category.category.name,
              }
           })
        }
    }
}

module.exports = SimpleFilmDto;
```

Film DTO (3/4) : `film-detail-dto.js`

```
class FilmDetailDto {
   constructor(film = {}) {
      const {id, title, description, length, release_year, special_features,rating, film_actor, film_category} = film;
      this.id = id ?? null;
      this.title = title ?? '-';
      this.releaseYear = release_year ?? '-';
      this.rating = rating ?? '-';
      this.description = description ?? '-';
      this.length = length ?? '-';
      this.specialFeatures = special_features ?? '-’;
      if (film_actor) {
         this.actors = film_actor.map(actor => {
            return {
               id: actor.actor_id,
               name: actor.actor.first_name.charAt(0) + actor.actor.first_name.slice(1).toLowerCase()
                  + ' ' + actor.actor.last_name.charAt(0) + actor.actor.last_name.slice(1).toLowerCase()
            }
         });
      }
```

Film DTO (4/4) : `film-detail-dto.js`

```
            if (film_category) {
                this.categories = film_category.map(category => {
                    return {
                        id: category.category_id,
                        name: category.category.name,
                    }
                })
            }
        }
}

module.exports = FilmDetailDto;
```

Film Controller (1/2): `film-controller.js`

```
const service = require('../services/film-service');
const FilmDetailDto = require('../dtos/film-detail-dto');
const SimpleFilmDto = require('../dtos/simple-film-dto’);
```

```
module.exports = {
   list: async function (req, res) {
      try {
         const includeActor = req.query.includeActor|| false;
         const {page, pageSize} = req.query;
         pageRequest = { page: Number(page) || 1, pageSize: Number(pageSize) || 10 };
         const pageFilm = await service.getAll(includeActor, pageRequest);
         const simpleFilms = pageFilm.data.map(film => new SimpleFilmDto(film));
         pageFilm.data = simpleFilms;
         res.json(pageFilm);
      } catch (e) {
         console.log(e, e.status);
         res.status(e.status||500).json({code: e.code, message: e.message, status: e.status});
      }
   },
```

Film Controller (2/2): `film-controller.js`

```
  get: async function (req, res) {
     const id = Number(req.params.id);
     try {
        const uniqueOne = await service.getById(id);
        res.json(new FilmDetailDto(uniqueOne));
     } catch (e) {
        res.status(e.status||500).json(
           {code: e.code, message: e.message, status: e.status});
     }
  },
}
```

Filter Film By Title (1) : `film-repository.js`

```
findAll: async function (includeActor = false,
               pageRequet = {page: 1, pageSize: 10}, filmTitle = null) {

  const {page, pageSize} = pageRequet;
  const totalItems = await prisma.film.count();

  const data = await prisma.film.findMany({
    skip: (page - 1) * pageSize,
    take: pageSize,
    include: {
        film_actor: includeActor ? {include: {actor: true}} : false,
    },
    where: filmTitle ? {title: {contains: filmTitle}} : {},
  });
```

Filter Film By Title : `film-controller.js`

```
list: async function (req, res) {
   try {
      const includeActor = req.query.includeActor|| false;
      const {page, pageSize} = req.query;

      const {filmTitle} = req.query;

      console.log(filters);
      pageRequest = {page: Number(page) || 1, pageSize: Number(pageSize) || 10};
      const pageFilm = await service.getAll(includeActor, pageRequest, filmTitle);
```

Filter Film By Title (2) : `film-repository.js`

```
findAll: async function (includeActor = false,
        pageRequet = {page: 1, pageSize: 10}, filmTitle = null) {

    const {page, pageSize} = pageRequet;
    const filmFiters = filmTitle ? {title: {contains: filmTitle}} : {}

    const totalItems = await prisma.film.count({where: filmFiters});

    const data = await prisma.film.findMany({
        skip: (page - 1) * pageSize,
        take: pageSize,
        include: {
            film_actor: includeActor ? {include: {actor: true}} : false,
        },
        where: filmFiters,
    });
```

Filter Film By Title & Rating : `film-controller.js`

```
list: async function (req, res) {
    try {
        const includeActor = req.query.includeActor|| false;
        const {page, pageSize} = req.query;
        const {filmTitle} = req.query;
        const filmRating = req.query.filmRating
            ? Array.isArray(req.query.filmRating)
                ? req.query.filmRating
                : [req.query.filmRating]
            : [];
        filters = {filmTitle, filmRating};
        console.log(filters);
        pageRequest = {page: Number(page) || 1, pageSize: Number(pageSize) || 10};
        const pageFilm = await service.getAll(includeActor, pageRequest, filters);
```

Filter Film By Title & Rating : `film-repository.js`

```
findAll: async function (includeActor = false, pageRequet = {page: 1, pageSize: 10},
                    filmFiters = {filmTitle: null, filmRating : []}) {
   const {page, pageSize} = pageRequet;
   const {filmTitle, filmRating} = filmFiters;
   const titleFiter = filmTitle ? {title: {contains: filmTitle}} : {}
   const ratingFilter = Object.keys(filmRating).length>0 ? {rating: {in: filmRating}}:null ;
   const filters = {...titleFiter?titleFiter: {} , ...(ratingFilter ? ratingFilter : {})};
   console.log(filters);
   const totalItems = await prisma.film.count({where: filters});
   const data = await prisma.film.findMany({
     skip: (page - 1) * pageSize,
     take: pageSize,
     include: {
       film_actor: includeActor ? {include: {actor: true}} : false,
   },
   where: filters,
});
```

Sorting Film By Title : `film-controller.js`

```
list: async function (req, res) {
   try {
      const sortBy = req.query.sortBy || null;
      const [key, value] = sortBy ? sortBy.split(":") : ["id", "asc"];
      const sortObj = { [key]: value || "asc" };

      const includeActor = req.query.includeActor|| false;
      const {page, pageSize} = req.query;
      const {filmTitle} = req.query;
      const filmRating = req.query.filmRating ? Array.isArray(req.query.filmRating)
            ? req.query.filmRating : [req.query.filmRating] : [];
      filters = {filmTitle, filmRating, sortBy:sortObj};
      console.log(filters);
      console.log(sortObj);
```

```
const pageFilm = await service.getAll(includeActor, pageRequest, filters);
```

Sorting Film By Title : `film-repository.js`

```
findAll: async function (includeActor = false, pageRequet = {page: 1, pageSize: 10},
                        filmFiters = {filmTitle: null, filmRating : [],sortBy: null}) {
   const {page, pageSize} = pageRequet;
   const {filmTitle, filmRating} = filmFiters;
   const titleFiter = filmTitle ? {title: {contains: filmTitle}} : {}
   const ratingFilter = Object.keys(filmRating).length>0 ?
      {rating: {in: filmRating}}:null ;
   const {sortBy} = filmFiters;
   const filters = {...titleFiter?titleFiter: {}, ...(ratingFilter ? ratingFilter : {})};
   console.log(filters);
   console.log('sort by:', sortBy);
```

```
const data = await prisma.film.findMany({
     :
     :
   where: filters,
   orderBy: sortBy,
});
```