Data Dictionary for Movie Rental Database

Version 1.1

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Version History:

1.0 (2024-10-23): Initial document creation

1.1 (2024-10-24): Added technical specifications, security controls, and enhanced sections

Contents

1. Overview of the Database

1.1. Database Name:

Movie Rental Database

Purpose:

This database supports online transaction processing for a movie rental service, allowing the management of customers, films, rentals, inventory, and payment processing. It helps track films, rental activities, customer payments, and staff details, ensuring smooth operations of a movie rental store.

Business Areas:

- Customer Relationship Management
- Inventory Management
- Film Catalog Management
- Rental Operations
- Payment Processing
- Store Operations
- Staff Management
- Geographic Location Management

1.2. Database Technical Specifications

System Information

- Database Type: PostgreSQL
- Character Set: UTF-8
- Collation: en_US.UTF-8
- Default Schema: public

Backup and Recovery

- Backup Schedule: Daily incremental, Weekly full
- Recovery Point Objective (RPO): 24 hours
- Recovery Time Objective (RTO): 4 hours
- Retention Period: 3 months

Environment Details

- Production Server: [Server specifications]
- High Availability: [Configuration details]
- Storage Configuration: [Storage details]

2. Security and Access Control

Access Levels

Database Administrator

- Full access to all database objects
- Schema modification rights
- Backup and recovery management

Reporting User

- Read-only access to non-sensitive data
- Report generation capabilities
- No modification rights

Data Protection

- Customer personal information: Encrypted at rest
- Payment data: PCI-DSS compliant encryption
- Passwords: Salted hash using industry-standard algorithms
- Audit logging: Enabled for all data modifications

3. Tables

3.1. Table Name: Actor

Description: Stores information about movie actors.

Column name	Data Type	Description	Default Value	Nullable
actor_id	SERIAL	Unique identifier for the actor.	None	No
first_name	CHARACTER VARYING(45)	Actor's first name.	None	No
last_name	CHARACTER VARYING(45)	Actor's last name.	None	No
last_update	TIMESTAMP(6) WITHOUT TIME ZONE	Timestamp of the last update.	CURRENT_TIMESTAMP	No

- Primary Key: actor_id
- Foreign Keys: None
- Used By: film_actor

3.2. Table Name: Film

Description: Contains information about the films available for rent.

Column Name	Data Type	Description	Default Value	Nullable
film_id	SERIAL	Unique identifier for the film.	None	No
title	CHARACTER VARYING(255)	The title of the film.	None	No
description	TEXT	Description of the film.	None	Yes
release_year	YEAR	Year of release.	None	Yes
language_id	SMALLINT	Language identifier, references language.	None	No

rental_duration	SMALLINT	Duration of rental in days.	3	No
rental_rate	NUMERIC(4,2)	Rental rate for the film.	apr.99	No
length	SMALLINT	Length of the film in minutes.	None	Yes
replacement_cost	NUMERIC(5,2)	Replacement cost of the film.	19.99	No
rating	MPAA_RATING	Film rating (e.g., PG, R).	None	Yes
special_features	TEXT	Special features of the film.	None	Yes
fulltext	TSVECTOR	Full-text search data.	None	No
last_update	TIMESTAMP(6) WITHOUT TIME ZONE	Timestamp of the last update.	CURRENT_TIMESTAMP	No

- Primary Key: film_id
- Foreign Keys: language_id references language(language_id)
- Used By: film_actor, film_category, inventory

3.3. Table Name: Customer Table

Description: Stores information about video rental customers

Column Name	Data Type	Description	Default Value	Nullable
customer_id	SERIAL	Unique identifier for each customer	N/A	No
store_id	SMALLINT	ID of the customer's primary store	N/A	No
first_name	VARCHAR	Customer's first name	N/A	No
last_name	VARCHAR	Customer's last name	N/A	No
email	VARCHAR	Customer's email address	NULL	Yes
address_id	SMALLINT	Foreign key to address table	N/A	No
activebool	BOOLEAN	Flag indicating if account is active	TRUE	No
create_date	DATE	Date customer account was created	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No
active	INTEGER	Numeric activity status indicator	NULL	Yes

- Primary Key: customer_id
- Foreign Keys:
  - store_id references store(store_id)
  - address_id references address(address_id)
- Used By: rental, payment

3.4. Table Name: Payment

Description: Records of customer payments for rentals

Column Name	Data Type	Description	Default Value	Nullable
payment_id	SERIAL	Unique identifier for each payment	N/A	No
customer_id	SMALLINT	Foreign key to customer table	N/A	No
staff_id	SMALLINT	Staff member who processed payment	N/A	No
rental_id	INTEGER	Associated rental transaction	N/A	No
amount	DECIMAL	Payment amount	N/A	No
payment_date	TIMESTAMP	Date and time of payment	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: payment_id
- Foreign Keys:
  - customer_id references customer(customer_id)
  - staff_id references staff(staff_id)
  - rental_id references rental(rental_id)

3.5. Table Name: Rental

Description: Tracks all rental transactions

Column Name	Data Type	Description	Default Value	Nullable
rental_id	SERIAL	Unique identifier for each rental	N/A	No
rental_date	TIMESTAMP	Date and time item was rented	N/A	No
inventory_id	INTEGER	Item rented from inventory	N/A	No
customer_id	SMALLINT	Customer who rented the item	N/A	No
return_date	TIMESTAMP	Date and time item was returned	NULL	Yes
staff_id	SMALLINT	Staff member who processed rental	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: rental_id
- Foreign Keys:
  - inventory_id references inventory(inventory_id)
  - customer_id references customer(customer_id)
  - staff_id references staff(staff_id)
- Used By: payment

3.6. Table Name: Inventory

Description: Tracks physical copies of films available for rent

Column Name	Data Type	Description	Default Value	Nullable
inventory_id	SERIAL	Unique identifier for each inventory item	N/A	No
film_id	SMALLINT	Foreign key to film table	N/A	No
store_id	SMALLINT	Store where item is located	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: inventory_id
- Foreign Keys:
  - film_id references film(film_id)
  - store_id references store(store_id)
- Used By: rental

3.7. Table Name: Staff

Description: Contains employee information

Column Name	Data Type	Description	Default Value	Nullable
staff_id	SERIAL	Unique identifier for each staff member	N/A	No
first_name	VARCHAR	Staff member's first name	N/A	No
last_name	VARCHAR	Staff member's last name	N/A	No
address_id	SMALLINT	Staff member's address	N/A	No
email	VARCHAR	Staff member's email address	NULL	Yes
store_id	SMALLINT	Store where employee works	N/A	No
active	BOOLEAN	Whether employee is currently active	TRUE	No
username	VARCHAR	Login username	N/A	No
password	VARCHAR	Login password	NULL	Yes
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: staff_id
- Foreign Keys:
  - address_id references address(address_id)
  - store_id references store(store_id)
- Used By: payment, rental, store

3.8. Table Name: Store

Description: Information about each store location

Column Name	Data Type	Description	Default Value	Nullable
store_id	SERIAL	Unique identifier for each store	N/A	No
manager_staff_id	SMALLINT	Staff ID of store manager	N/A	No
address_id	SMALLINT	Store's physical address	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: store_id
- Foreign Keys:
  - manager_staff_id references staff(staff_id)
  - address_id references address(address_id)
- Used By: inventory, staff, customer

3.9. Table Name: Language

Description: Stores available languages for films

Column Name	Data Type	Description	Default Value	Nullable
language_id	SERIAL	Unique identifier for each language	N/A	No
name	VARCHAR	Name of the language	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: language_id
- Used By: film

3.10. Table Name: Film_Actor

Description: Junction table linking films to actors (many-to-many relationship)

Column Name	Data Type	Description	Default Value	Nullable
actor_id	SMALLINT	Reference to actor	N/A	No
film_id	SMALLINT	Reference to film	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: (actor_id, film_id) composite key
- Foreign Keys:
  - actor_id references actor(actor_id)
  - film_id references film(film_id)

3.11. Table Name: Film_Category

Description: Junction table linking films to categories (many-to-many relationship)

Column Name	Data Type	Description	Default Value	Nullable
film_id	SMALLINT	Reference to film	N/A	No
category_id	SMALLINT	Reference to category	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: (film_id, category_id) composite key
- Foreign Keys:
  - film_id references film(film_id)
  - category_id references category(category_id)

3.12. Table Name: Category

Description: Stores film categories/genres

Column Name	Data Type	Description	Default Value	Nullable
category_id	SERIAL	Unique identifier for each category	N/A	No
name	VARCHAR	Name of the category (e.g., Action, Comedy)	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: category_id
- Used By: film_category

3.13. Table Name: Address

Description: Stores address information for customers, staff, and stores

Column Name	Data Type	Description	Default Value	Nullable
address_id	SERIAL	Unique identifier for each address	N/A	No
address	VARCHAR	Street address	N/A	No
address2	VARCHAR	Additional address line	NULL	Yes
district	VARCHAR	District/state/province	N/A	No
city_id	SMALLINT	Reference to city	N/A	No
postal_code	VARCHAR	Postal/ZIP code	NULL	Yes
phone	VARCHAR	Contact phone number	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: address_id
- Foreign Keys:
  - city_id references city(city_id)
- Used By: customer, staff, store

3.14. Table Name: City

Description: Stores city information

Column Name	Data Type	Description	Default Value	Nullable
city_id	SERIAL	Unique identifier for each city	N/A	No
city	VARCHAR	Name of the city	N/A	No
country_id	SMALLINT	Reference to country	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: city_id
- Foreign Keys:
  - country_id references country(country_id)
- Used By: address

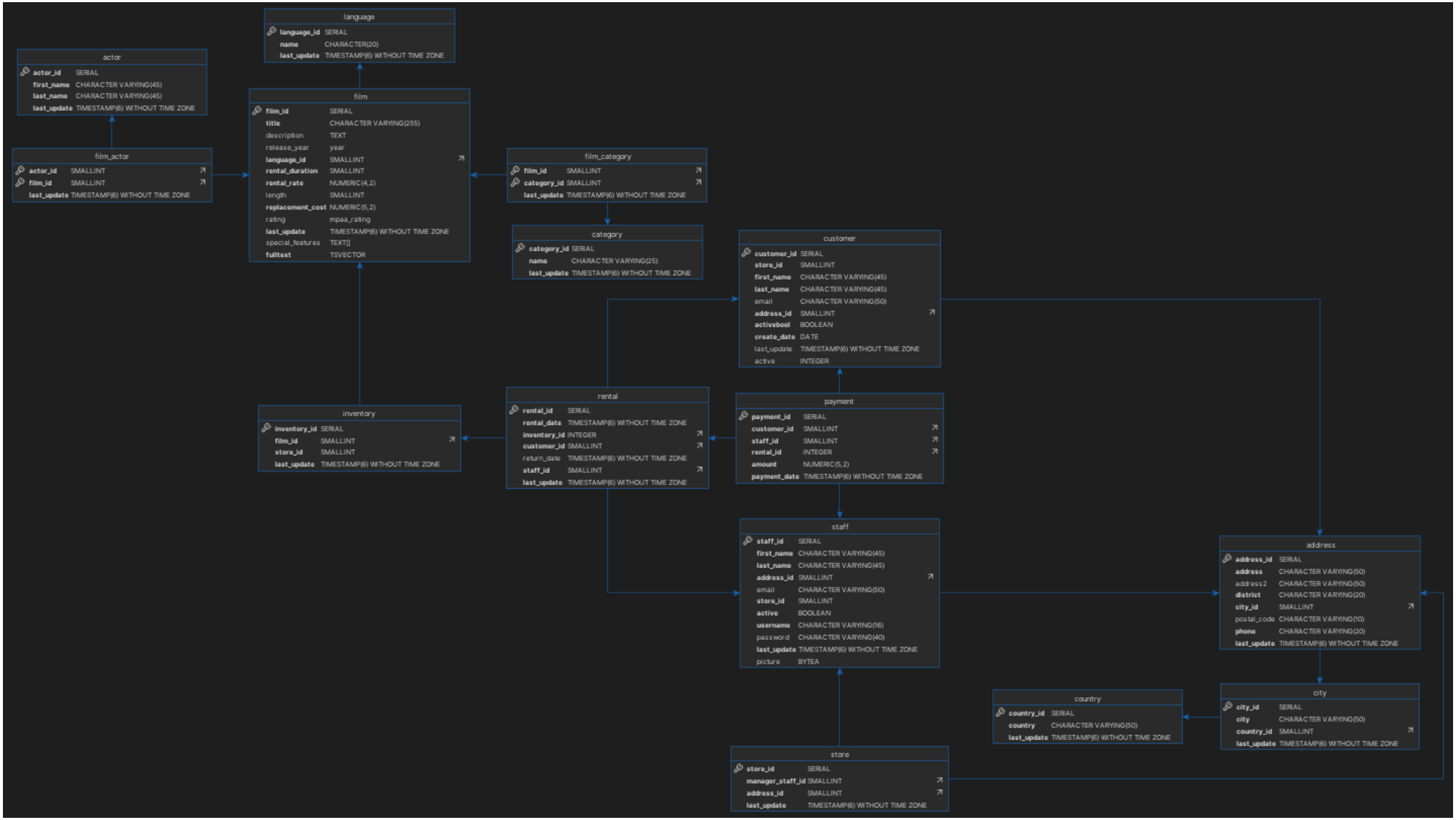
3.15. Table Name: Country

Description: Stores country information

Column Name	Data Type	Description	Default Value	Nullable
country_id	SERIAL	Unique identifier for each country	N/A	No
country	VARCHAR	Name of the country	N/A	No
last_update	TIMESTAMP	Timestamp of last record update	CURRENT_TIMESTAMP	No

- Primary Key: country_id
- Used By: city

4. Views


language
language_id SERIAL
name CHARACTER(20)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
actor
actor_id SERIAL
first_name CHARACTER VARYING(45)
last_name CHARACTER VARYING(45)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
film
film_id SERIAL
title CHARACTER VARYING(255)
description TEXT
release_year year
language_id SMALLINT
rental_duration SMALLINT
rental_rate NUMERIC(4,2)
length SMALLINT
replacement_cost NUMERIC(5,2)
rating mpaa_rating
last_update TIMESTAMP(6) WITHOUT TIME ZONE
special_features TEXT[]
fulltext TSVECTOR
film_actor
actor_id SMALLINT
film_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE
film_category
film_id SMALLINT
category_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE
category
category_id SERIAL
name CHARACTER VARYING(25)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
customer
customer_id SERIAL
store_id SMALLINT
first_name CHARACTER VARYING(45)
last_name CHARACTER VARYING(45)
email CHARACTER VARYING(50)
address_id SMALLINT
activebool BOOLEAN
create_date DATE
last_update TIMESTAMP(6) WITHOUT TIME ZONE
active INTEGER
inventory
inventory_id SERIAL
film_id SMALLINT
store_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE
rental
rental_id SERIAL
rental_date TIMESTAMP(6) WITHOUT TIME ZONE
inventory_id INTEGER
customer_id SMALLINT
return_date TIMESTAMP(6) WITHOUT TIME ZONE
staff_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE
payment
payment_id SERIAL
customer_id SMALLINT
staff_id SMALLINT
rental_id INTEGER
amount NUMERIC(5,2)
payment_date TIMESTAMP(6) WITHOUT TIME ZONE
staff
staff_id SERIAL
first_name CHARACTER VARYING(45)
last_name CHARACTER VARYING(45)
address_id SMALLINT
email CHARACTER VARYING(50)
store_id SMALLINT
active BOOLEAN
username CHARACTER VARYING(16)
password CHARACTER VARYING(40)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
picture BYTEA
address
address_id SERIAL
address CHARACTER VARYING(50)
address2 CHARACTER VARYING(50)
district CHARACTER VARYING(20)
city_id SMALLINT
postal_code CHARACTER VARYING(10)
phone CHARACTER VARYING(20)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
country
country_id SERIAL
country CHARACTER VARYING(50)
last_update TIMESTAMP(6) WITHOUT TIME ZONE
city
city_id SERIAL
city CHARACTER VARYING(50)
country_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE
store
store_id SERIAL
manager_staff_id SMALLINT
address_id SMALLINT
last_update TIMESTAMP(6) WITHOUT TIME ZONE

5. Stored Procedures

[List of stored procedures with input parameters and output details here.]

6. Functions

[List of functions with input parameters and return types here.]

7. Data Integrity Rules and Constraints

7.1. Primary Key Constraints:

- All tables have primary keys
- Junction tables (film_actor, film_category) use composite keys

7.2. Foreign Key Constraints:

- Maintain referential integrity between related tables
- Cascade updates for last_update timestamps
- Prevent deletion of referenced records

7.3. Default Values:

- last_update fields default to CURRENT_TIMESTAMP
- active/activebool fields typically default to TRUE
- Some fields allow NULL values (email, address2, postal_code)

7.4. Data Validation:

- Postal codes follow country-specific formats
- Email addresses must be valid format
- Phone numbers must be valid format
- Dates must be valid

8. Data Flow and Usage

8.1. Customer Flow:

- Customer registration → address/location details → rental transactions → payments
- Customer activity tracking through rental history
- Payment processing and history maintenance

8.2. Inventory Flow:

- Film catalog management → inventory allocation to stores
- Rental tracking → return processing
- Stock level monitoring

8.3. Staff Operations:

- Staff management and store assignment
- Rental and payment processing
- Store management hierarchy

8.4. Location Management:

- Hierarchical location data: Country → City → Address
- Address management for customers, staff, and stores

9. Performance Optimization

9.1. Indexing Strategy

Primary Key Indexes

- Clustered indexes on all primary key columns
- Optimized for sequential access

Foreign Key Indexes

- Non-clustered indexes on all foreign key columns
- Supports efficient joins

Search Optimization Indexes

Sql

```
CREATE INDEX idx_film_title ON film(title);
CREATE INDEX idx_customer_email ON customer(email);
CREATE INDEX idx_payment_date ON payment(payment_date);
CREATE INDEX idx_rental_date ON rental(rental_date);
```

9.2. Query Optimization Guidelines

Best Practices

- Use covering indexes for frequent queries
- Avoid SELECT *
- Implement appropriate JOIN types
- Use parameterized queries

Performance Considerations

- Implement pagination for large result sets
- Use appropriate data types
- Regular statistics updates
- Proper use of temporary tables

10. Business Rules

10.1. Rental Policies

Duration and Limits

- Standard rental duration: 3 days
- Maximum rental duration: 7 days
- Maximum concurrent rentals: 3 per customer

Late Fees

- Grace period: 1 day
- Late fee calculation: $1.00 per day
- Maximum late fee: Original rental cost × 2

10.2. Payment Rules

Payment Methods

- Credit/Debit cards
- Cash
- Store credit

Financial Policies

- Minimum payment: $1.00
- Refund window: 24 hours
- Security deposit: Required for new customers

10.3. Inventory Management

Stock Levels

- Minimum copies per film: 2
- Reorder threshold: When 80% are rented
- Maximum copies per film: Based on demand

Replacement Rules

- Damage assessment process
- Replacement cost calculation
- Write-off procedures

11.Glossary of Terms

Term	Definition
active/activebool	Status indicator for customer/staff accounts
address_id	Unique identifier for physical addresses
category_id	Unique identifier for film genres/categories
customer_id	Unique identifier for registered customers
film_id	Unique identifier for unique film titles
inventory_id	Unique identifier for physical copies of films
language_id	Identifier for available film languages
last_update	Timestamp of most recent record modification
manager_staff_id	Staff ID of the store manager
payment_id	Unique identifier for payment transactions
rental_duration	Standard number of days for film rental
rental_id	Unique identifier for rental transactions
replacement_cost	Cost charged if film is damaged/not returned
staff_id	Unique identifier for staff members
store_id	Unique identifier for store locations
RPO	Recovery Point Objective - Maximum acceptable data loss
RTO	Recovery Point Objective - Maximum acceptable data loss
Grace Period	Recovery Point Objective - Maximum acceptable data loss
Security Deposit	Refundable amount held for new customers
Write-off	Process of removing damaged inventory from system