Welcome!

FUNCTIONS FOR MANIPULATING DATA IN POSTGRESQL

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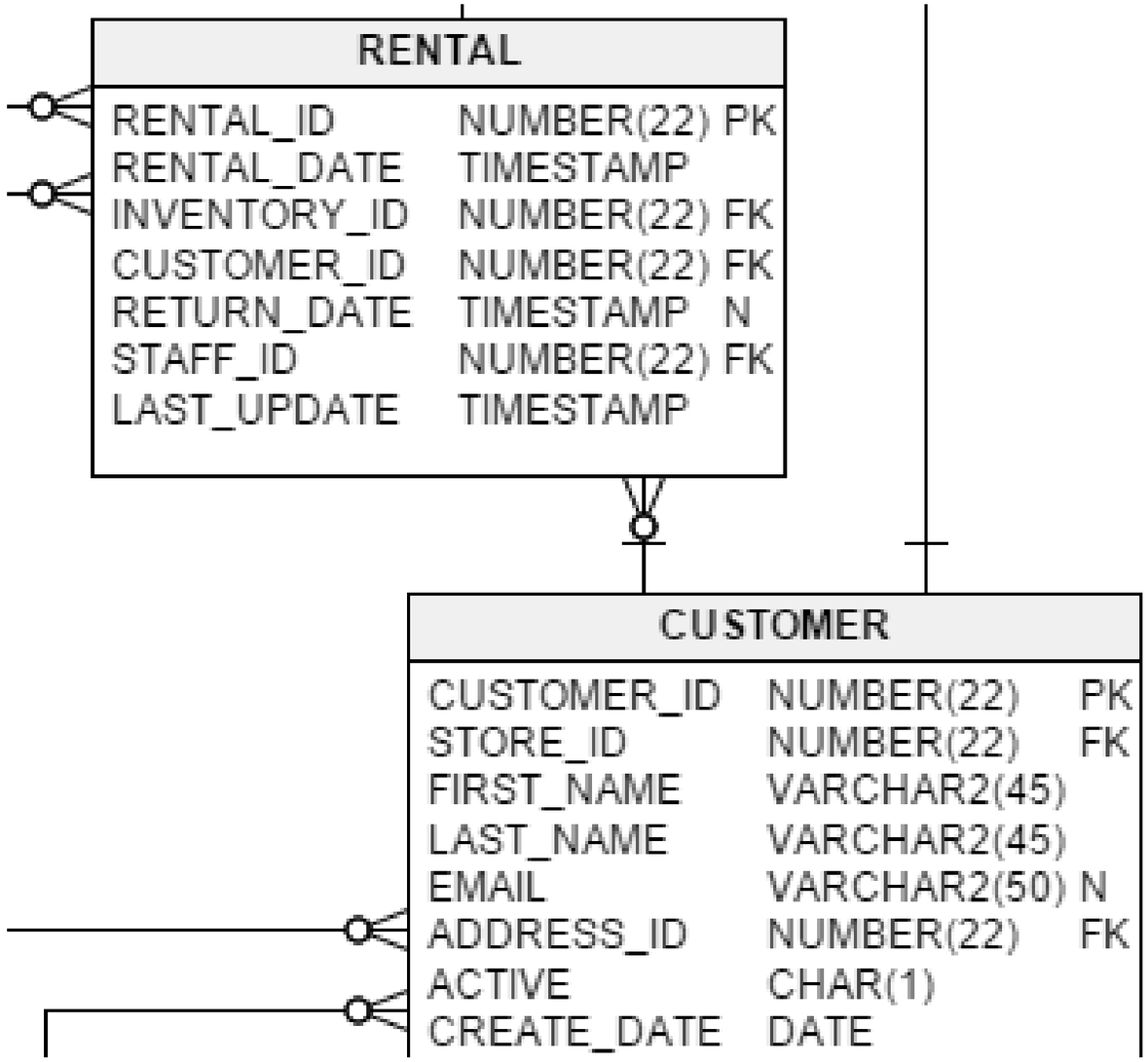
The Sakila Database



- Highly normalized
- Representative data types
- Custom functions

Topics

- Common data types in PostgreSQL
- Date and time functions and operators
- Parsing and manipulating text
- Full-text search and PostgreSQL Extensions

Common data types

- Text data types
  - `CHAR`, `VARCHAR` and `TEXT`
- Numeric data types
  - `INT` and `DECIMAL`
- Date / time data types
  - `DATE`, `TIME`, `TIMESTAMP`, `INTERVAL`
- Arrays

Text data types

```
SELECT title
FROM film
LIMIT 5
```

```
+------------------+
| title            |
|------------------|
| ACADEMY DINOSAUR |
| ACE GOLDFINGER   |
| ADAPTATION HOLES |
| AFFAIR PREJUDICE |
| AFRICAN EGG      |
+------------------+
```

```
SELECT description
FROM film
LIMIT 2
```

```
+----------------------------------------+
| description                            |
|----------------------------------------|
| A Epic Drama of a Feminist And a Mad   |
|  Scientist who must Battle a Teacher in |
|  The Canadian Rockies.                 |
| A Astounding Epistle of a Database     |
|  Administrator And a Explorer who      |
|  must Find a Car in Ancient China      |
+----------------------------------------+
```

Numeric data types

```
SELECT
    payment_id
FROM payment
LIMIT 5
```

```
+-------------+
| payment_id  |
|-------------|
| 1           |
| 2           |
| 3           |
| 4           |
| 5           |
+-------------+
```

```
SELECT
    amount
FROM payment
LIMIT 5
```

```
+--------+
| amount |
|--------|
| 2.99   |
| 0.99   |
| 5.99   |
| 0.99   |
| 9.99   |
+--------+
```

Determining data types from existing tables

```
SELECT
    title,
    description,
    special_features
FROM FILM
LIMIT 5
```

```
+---------------+------------------+------------------------------+
| title         |  description     | special_features             |
|---------------|------------------|------------------------------|
| ACADEMY D...  | A Epic...        | {Deleted Scenes,Behi...}     |
| ACE GOLD...   | A Astound..      | {Trailers,Deleted Scenes}    |
| AFFAIR PR...  | A Fanciful,..    | {Commentaries,Behind the...} |
+---------------+------------------+------------------------------+
```

Determining data types from existing tables

```
SELECT
    column_name,
    data_type
FROM INFORMATION_SCHEMA.COLUMNS
WHERE column_name in ('title','description','special_features')
  AND table_name ='film';
```

```
+------------------+-------------------+
| column_name      | data_type         |
|------------------|-------------------|
| title            | character varying |
| description      | text              |
| special_features | ARRAY             |
+------------------+-------------------+
```

Let's practice!

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Date and time data types

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TIMESTAMP data types

- ISO 8601 format: yyyy-mm-dd

```
+-----------------------------+
| timestamp                   |
|-----------------------------|
| 2019-03-26 01:05:17.93027+00 |
+-----------------------------+
```

```sql
SELECT payment_date
FROM payment;
```

```
+--------------------+
| payment_date       |
|--------------------|
| 2005-05-25 11:30:37 |
+--------------------+
```

DATE and TIME data types

```
+------------+-------------------+
| date       | time              |
|------------|-------------------|
| 2005-05-28 | 01:05:17.93027+00 |
+------------+-------------------+
```

```
SELECT create_date
FROM customer
```

```
+-------------+
| create_date |
|-------------|
| 2006-02-14  |
+-------------+
```

INTERVAL data types

```
+-----------+
| interval  |
|-----------|
| 4 days    |
+-----------+
```

```sql
SELECT rental_date + INTERVAL '3 days' as expected_return
FROM rental;
```

```
+---------------------+
| expected_return     |
|---------------------|
| 2005-05-27 22:53:30 |
+---------------------+
```

Looking at date and time types

```
SELECT
    column_name,
    data_type
FROM INFORMATION_SCHEMA.COLUMNS
WHERE column_name in ('rental_date')
  AND table_name ='rental';
```

```
+-------------+-----------------------------+
| column_name | data_type                   |
|-------------|-----------------------------|
| rental_date | timestamp without time zone |
+-------------+-----------------------------+
```

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Working with ARRAYs

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Before we get started

CREATE TABLE example

```
CREATE TABLE my_first_table (
    first_column text,
    second_column integer
);
```

INSERT example

```
INSERT INTO my_first_table
    (first_column, second_column) VALUES ('text value', 12);
```

ARRAY a special type

Let's create a simple table with two array columns.

```
CREATE TABLE grades (
    student_id int,
    email text[][],
    test_scores int[]
);
```

INSERT statements with ARRAYS

Example INSERT statement:

```
INSERT INTO grades
    VALUES (1,
    '{{"work","work1@datacamp.com"},{"other","other1@datacamp.com"}}',
    '{92,85,96,88}' );
```

Accessing ARRAYs

```
SELECT
   email[1][1] AS type,
   email[1][2] AS address,
   test_scores[1],
FROM grades;
```

```
+--------+--------------------+-------------+
| type   |  address           | test_scores |
|--------|--------------------|-------------|
| work   | work1@datacamp.com | 92          |
| work   | work2@datacamp.com | 76          |
+--------+--------------------+-------------+
```

Note that PostgreSQL array indexes start with one and not zero.

Searching ARRAYs

```
SELECT
   email[1][1] as type,
   email[1][2] as address,
   test_scores[1]
FROM grades
WHERE email[1][1] = 'work';
```

```
+--------+--------------------+-------------+
| type   |  address           | test_scores |
|--------|--------------------|-------------|
| work   | work1@datacamp.com | 92          |
| work   | work2@datacamp.com | 76          |
+--------+--------------------+-------------+
```

ARRAY functions and operators

```
SELECT
   email[2][1] as type,
   email[2][2] as address,
   test_scores[1]
FROM grades
WHERE 'other' = ANY (email);
```

```
+---------+---------------------+-------------+
| type    |  address            | test_scores |
|---------|-------------------------------------|
| other   | other1@datacamp.com | 92          |
| null    | null                | 76          |
+---------+---------------------+-------------+
```

ARRAY functions and operators

```
SELECT
   email[2][1] as type,
   email[2][2] as address,
   test_scores[1]
FROM grades
WHERE email @> ARRAY['other'];
```

```
+---------+----------------------+-------------+
| type    |  address             | test_scores |
|---------|-----------------------------------|
| other   | other1@datacamp.com | 92          |
| null    | null                 | 76          |
+---------+----------------------+-------------+
```

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Overview of basic arithmetic operators

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Topics

- Overview of basic arithmetic operators
- The `CURRENT_DATE`, `CURRENT_TIMESTAMP`, `NOW()` functions
- The `AGE()` function
- The `EXTRACT()`, `DATE_PART()`, and `DATE_TRUNC()` functions

Adding and subtracting date / time data

```
SELECT date '2005-09-11' - date '2005-09-10';
```

```
+----------+
| integer  |
|----------|
| 1        |
+----------+
```

Adding and subtracting date / time data

```
SELECT date '2005-09-11' + integer '3';
```

```
+------------+
| date       |
|------------|
| 2005-09-14 |
+------------+
```

Adding and subtracting date / time data

```
SELECT date '2005-09-11 00:00:00' - date '2005-09-09 12:00:00';
```

```
+-----------------+
| interval        |
|-----------------|
| 1 day 12:00:00 |
+-----------------+
```

Calculating time periods with AGE

```
SELECT AGE(timestamp '2005-09-11 00:00:00', timestamp '2005-09-09 12:00:00');
```

```
+-----------------+
| interval        |
|-----------------|
| 1 day 12:00:00 |
+-----------------+
```

DVDs, really??

```
SELECT
    AGE(rental_date)
FROM rental;
```

```
+---------------------------------+
| age                             |
|---------------------------------|
| 13 years 11 mons 12 days 01:06:30 |
| 13 years 11 mons 12 days 01:05:27 |
| 13 years 11 mons 12 days 00:56:21 |
+---------------------------------+
```

Date / time arithmetic using INTERVALs

```
SELECT rental_date + INTERVAL '3 days' as expected_return
FROM rental;
```

```
+---------------------+
| expected_return     |
|---------------------|
| 2005-05-27 22:53:30 |
+---------------------+
```

Date / time arithmetic using INTERVALs

```
SELECT timestamp '2019-05-01' + 21 * INTERVAL '1 day';
```

```
+----------------------------+
| timestamp without timezone |
|----------------------------|
| 2019-05-22 00:00:00        |
+----------------------------+
```

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Functions for retrieving current date/time

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Retrieving the current timestamp

```
SELECT NOW();
```

```
+-------------------------------+
| now()                         |
|-------------------------------|
| 2019-04-19 02:51:18.448641+00 |
+-------------------------------+
```

Retrieving the current timestamp

```
SELECT NOW()::timestamp;
```

```
+----------------------------+
| now()                      |
|----------------------------|
| 2019-04-19 02:51:18.448641 |
+----------------------------+
```

Retrieving the current timestamp

PostgreSQL specific casting

```
SELECT NOW()::timestamp;
```

CAST() function

```
SELECT CAST(NOW() as timestamp);
```

Retrieving the current timestamp

```
SELECT CURRENT_TIMESTAMP;
```

```
+-------------------------------+
| current_timestamp             |
|-------------------------------|
| 2019-04-19 02:51:18.448641+00 |
+-------------------------------+
```

Retrieving the current timestamp

```
SELECT CURRENT_TIMESTAMP(2);
```

```
+-------------------------------+
| current_timestamp             |
|-------------------------------|
| 2019-04-19 02:51:18.44+00     |
+-------------------------------+
```

Current date and time

```
SELECT CURRENT_DATE;
```

```
+--------------+
| current_date |
|--------------|
| 2019-04-19   |
+--------------+
```

Current date and time

```
SELECT CURRENT_TIME;
```

```
+-------------------------+
| current_time            |
|-------------------------|
| 04:06:30.929845+00:00   |
+-------------------------+
```

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Extracting and transforming date / time data

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Extracting and transforming date and time data

Exploring the `EXTRACT()`, `DATE_PART()` and `DATE_TRUNC()` functions

- Transactional timestamp precision not useful for analysis

```
2005-05-13 08:53:53
```

- Often need to extract parts of timestamps

```
2005 or 5 or 2 or Friday
```

- Or convert / truncate timestamp precision to standardize

```
2005-05-13 00:00:00
```

Extracting and transforming date / time data

- EXTRACT(**field** *FROM* **source**)

```
SELECT EXTRACT(quarter FROM timestamp '2005-01-24 05:12:00') AS quarter;
```

- DATE_PART(**'field'**, **source**)

```
SELECT DATE_PART('quarter', timestamp '2005-01-24 05:12:00') AS quarter;
```

```
+---------+
| quarter |
|---------|
| 1       |
+---------+
```

Extracting sub-fields from timestamp data

Transactional data from DVD Rentals *payment* table

```
SELECT * FROM payment;
```

```
+------------------------------------------------------------------------------+
| payment_id | customer_id | staff_id | rental_id | amount | payment_date         |
|------------|-------------|----------|-----------|--------|----------------------|
| 1          | 1           | 1        | 76        | 2.99   | 2005-05-25 11:30:37 |
| 2          | 1           | 1        | 573       | 0.99   | 2005-05-28 10:35:23 |
| 3          | 1           | 1        | 1185      | 5.99   | 2005-06-15 0:54:12  |
+------------------------------------------------------------------------------+
```

Extracting sub-fields from timestamp data

Data from *payment* table by year and quarter

```
SELECT
  EXTRACT(quarter FROM payment_date) AS quarter,
  EXTRACT(year FROM payment_date) AS year,
  SUM(amount) AS total_payments
FROM
  payment
GROUP BY 1, 2;
```

Results

```
+---------------------------------+
| quarter | year | total_payments |
|---------|------|----------------|
| 2       | 2005 | 14456.31       |
| 3       | 2005 | 52446.02       |
| 1       | 2006 | 514.18         |
+---------------------------------+
```

Truncating timestamps using DATE_TRUNC()

The `DATE_TRUNC()` function will truncate timestamp or interval data types.

- Truncate timestamp '2005-05-21 15:30:30' by year

```
SELECT DATE_TRUNC('year', TIMESTAMP '2005-05-21 15:30:30');
```

```
Result: 2005-01-01 00:00:00
```

- Truncate timestamp '2005-05-21 15:30:30' by month

```
SELECT DATE_TRUNC('month', TIMESTAMP '2005-05-21 15:30:30');
```

```
Result: 2005-05-01 00:00:00
```

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Reformatting string and character data

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Topics

- Reformatting string and character data.
- Parsing string and character data.
- Determine string length and character position.
- Truncating and padding string data.

The string concatenation operator

```
SELECT
  first_name,
  last_name,
  first_name || ' ' || last_name AS full_name
FROM customer
```

```
+------------+-----------+--------------------+
| first_name | last_name | full_name          |
|------------|-----------|--------------------|
| MARY       | SMITH     | MARY SMITH         |
| LINDA      | WILLIAMS  | LINDA WILLIAMS     |
+------------+-----------+--------------------+
```

String concatenation with functions

```
SELECT
  CONCAT(first_name,' ', last_name) AS full_name
FROM customer;
```

```
+-----------------------------------------+
| first_name | last_name | full_name      |
|-----------------------------------------|
| MARY       | SMITH     | MARY SMITH     |
| LINDA      | WILLIAMS  | LINDA WILLIAMS |
+-----------------------------------------+
```

String concatenation with a non-string input

```
SELECT
  customer_id || ': '
  || first_name || ' '
  || last_name AS full_name
FROM customer;
```

```
+--------------------+
| full_name          |
|--------------------|
| 1: MARY SMITH      |
| 2: LINDA WILLIAMS  |
+--------------------+
```

Changing the case of string

```
SELECT
  UPPER(email)
FROM customer;
```

```
+-----------------------------------+
| UPPER(email)                      |
|-----------------------------------|
| MARY.SMITH@SAKILACUSTOMER.ORG     |
| PATRICIA.JOHNSON@SAKILACUSTOMER.ORG |
| LINDA.WILLIAMS@SAKILACUSTOMER.ORG |
+-----------------------------------+
```

Changing the case of string

```
SELECT
  LOWER(title)
FROM film;
```

```
+--------------------+
| LOWER(title)       |
|--------------------|
| academy dinosaur   |
| ace goldfinger     |
| adaptation holes   |
+--------------------+
```

Changing the case of string

```
SELECT
  INITCAP(title)
FROM film;
```

```
+--------------------+
| INITCAP(title)     |
|--------------------|
| Academy Dinosaur   |
| Ace Goldfinger     |
| Adaptation Holes   |
+--------------------+
```

Replacing characters in a string

```
SELECT description FROM film;
```

```
+-------------------------------------------------+
| description                                     |
|-------------------------------------------------|
| A Epic Drama of a Feminist And a Mad Scientist...       |
| A Astounding Epistle of a Database Administrator...     |
| A Astounding Reflection of a Lumberjack And a Car...    |
| A Fanciful Documentary of a Frisbee And a Lumberjack... |
| A Fast-Paced Documentary of a Pastry Chef And a...       |
+-------------------------------------------------+
```

Replacing characters in a string

```
SELECT
    REPLACE(description, 'A Astounding',
                'An Astounding') as description
FROM film;
```

```
+-----------------------------------------------------+
| description                                         |
|-----------------------------------------------------|
| A Epic Drama of a Feminist And a Mad Scientist...   |
| An Astounding Epistle of a Database Administrator...|
| An Astounding Reflection of a Lumberjack And a Car...|
+-----------------------------------------------------+
```

Manipulating string data with REVERSE

```
SELECT
  title,
  REVERSE(title)
FROM
  film AS f;
```

```
+-----------------------------------+
| title              | reverse(title)   |
|-----------------------------------|
| ACADEMY DINOSAUR | RUASONID YMEDACA |
| ACE GOLDFINGER   | REGNIFDLOG ECA   |
+-----------------------------------+
```

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Parsing string and character data

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Determining the length of a string

```
SELECT
    title,
    CHAR_LENGTH(title)
FROM film;
```

```
+------------------+----------------------+
| title            | CHAR_LENGTH(title)   |
|------------------+----------------------|
| ACADEMY DINOSAUR | 16                   |
| ACE GOLDFINGER   | 14                   |
| ADAPTATION HOLES | 16                   |
+------------------+----------------------+
```

Determining the length of a string

```
SELECT
    title,
    LENGTH(title)
FROM film;
```

```
+--------------------+-----------------+
| title              | LENGTH(title)   |
|--------------------+-----------------|
| ACADEMY DINOSAUR   | 16              |
| ACE GOLDFINGER     | 14              |
| ADAPTATION HOLES   | 16              |
+--------------------+-----------------+
```

Finding the position of a character in a string

```
SELECT
    email,
    POSITION('@' IN email)
FROM customer;
```

```
+-----------------------------------+-------------------------+
| email                             | POSITION('@' IN email) |
|-----------------------------------|-------------------------|
| MARY.SMITH@sakilacustomer.org     | 11                      |
| PATRICIA.JOHNSON@sakilacustomer.org | 17                    |
| LINDA.WILLIAMS@sakilacustomer.org | 15                      |
+-----------------------------------+-------------------------+
```

Finding the position of a character in a string

```
SELECT
    email,
    STRPOS(email, '@')
FROM customer;
```

```
+-----------------------------------+--------------------+
| email                             | STRPOS(email, '@') |
|-----------------------------------|--------------------|
| MARY.SMITH@sakilacustomer.org     | 11                 |
| PATRICIA.JOHNSON@sakilacustomer.org | 17               |
| LINDA.WILLIAMS@sakilacustomer.org | 15                 |
+-----------------------------------+--------------------+
```

Parsing string data

```
SELECT
    LEFT(description, 50)
FROM film;
```

```
+--------------------------------------------------+
| description                                      |
|--------------------------------------------------|
| A Epic Drama of a Feminist And a Mad Scientist who |
| A Astounding Epistle of a Database Administrator A |
| A Astounding Reflection of a Lumberjack And a Car  |
+--------------------------------------------------+
```

Parsing string data

```
SELECT
    RIGHT(description, 50)
FROM film;
```

```
+--------------------------------------------------+
| description                                      |
|--------------------------------------------------|
|  who must Battle a Teacher in The Canadian Rockies |
| nd a Explorer who must Find a Car in Ancient China |
| Car who must Sink a Lumberjack in A Baloon Factory |
+--------------------------------------------------+
```

Extracting substrings of character data

```
SELECT
    SUBSTRING(description, 10, 50)
FROM
  film AS f;
```

```
+----------------------------------------------------+
| description                                        |
|----------------------------------------------------|
| ama of a Feminist And a Mad Scientist who must Bat |
| ing Epistle of a Database Administrator And a Expl |
| ing Reflection of a Lumberjack And a Car who must  |
+----------------------------------------------------+
```

Extracting substrings of character data

```
SELECT
    SUBSTRING(email FROM 0 FOR POSITION('@' IN email))
FROM
  customer;
```

```
+-----------------------------------------------+
| SUBSTRING(email FROM 0 FOR POSITION('@' IN email)) |
|-----------------------------------------------|
| MARY.SMITH                                    |
| PATRICIA.JOHNSON                              |
| LINDA.WILLIAMS                                |
+-----------------------------------------------+
```

Extracting substrings of character data

```
SELECT
    SUBSTRING(email FROM POSITION('@' IN email)+1 FOR CHAR_LENGTH(email))
FROM
  customer;
```

```
+-----------------------------------------------------------------+
| SUBSTRING(email FROM POSITION('@' IN email)+1 FOR CHAR_LENGTH(email)) |
|-----------------------------------------------------------------|
| sakilacustomer.org                                              |
| sakilacustomer.org                                              |
| sakilacustomer.org                                              |
+-----------------------------------------------------------------+
```

Extracting substrings of character data

```
SELECT
    SUBSTR(description, 10, 50)
FROM
  film AS f;
```

```
+----------------------------------------------------+
| description                                        |
|----------------------------------------------------|
| ama of a Feminist And a Mad Scientist who must Bat |
| ing Epistle of a Database Administrator And a Expl |
| ing Reflection of a Lumberjack And a Car who must  |
+----------------------------------------------------+
```

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Truncating and padding string data

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Removing whitespace from strings

```
TRIM([leading | trailing | both] [characters] from string)
```

- **First parameter:** [leading | trailing | both]
- **Second parameter:** [characters]
- **Third parameter:** from string

Removing whitespace from strings

```
SELECT TRIM('  padded  ');
```

```
+--------+
| TRIM   |
|--------|
| padded |
+--------+
```

Removing whitespace from strings

```
SELECT LTRIM('  padded   ');
```

```
+------------+
| LTRIM      |
|------------|
| padded     |
+------------+
```

Removing whitespace from strings

```
SELECT RTRIM('   padded    ');
```

```
+----------+
| RTRIM    |
|----------|
|   padded |
+----------+
```

Padding strings with character data

```
SELECT LPAD('padded', 10, '#');
```

```
+-------------+
| LPAD        |
|-------------|
| ####padded  |
+-------------+
```

Padding strings with whitespace

```
SELECT LPAD('padded', 10);
```

```
+-------------+
| LPAD        |
|-------------|
|     padded  |
+-------------+
```

```
SELECT LPAD('padded', 5);
```

```
+------------+
| LPAD       |
|------------|
|     padde  |
+------------+
```

Padding strings with whitespace

```
SELECT RPAD('padded', 10, '#');
```

```
+-------------+
| RPAD        |
|-------------|
| padded####  |
+-------------+
```

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Introduction to full-text search

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Topics

- Full Text search
- Extending PostgreSQL
- Improving full text search with extensions

The LIKE operator

_ wildcard: Used to match exactly one character.

% wildcard: Used to match zero or more characters.

```
SELECT title
FROM film
WHERE title LIKE 'ELF%';
```

```
+----------------------+
| title                |
+----------------------+
| ELF PARTY            |
+----------------------+
```

The LIKE operator

```
SELECT title
FROM film
WHERE title LIKE '%ELF';
```

```
+----------------------+
| title                |
+----------------------+
| ENCINO ELF           |
| GHOSTBUSTERS ELF     |
+----------------------+
```

The LIKE operator

```
SELECT title
FROM film
WHERE title LIKE '%elf%';
```

```
+----------------------+
| title                |
+----------------------+
```

LIKE versus full-text search

```
SELECT title, description
FROM film
WHERE to_tsvector(title) @@ to_tsquery('elf');
```

```
+----------------------+
| title                |
+----------------------+
| ELF PARTY            |
| ENCINO ELF           |
| GHOSTBUSTERS ELF     |
+----------------------+
```

What is full-text search?

Full text search provides a means for performing natural language queries of text data in your database.

- Stemming
- Spelling mistakes
- Ranking

Full-text search syntax explained

```
SELECT title, description
FROM film
WHERE to_tsvector(title) @@ to_tsquery('elf');
```

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Extending PostgreSQL

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User-defined data types

Enumerated data types

```
CREATE TYPE dayofweek AS ENUM (
      'Monday',
      'Tuesday',
      'Wednesday',
      'Thursday',
      'Friday',
      'Saturday',
      'Sunday'
);
```

Getting information about user-defined data types

```
SELECT typname, typcategory
FROM pg_type
WHERE typname='dayofweek';
```

```
+-----------+-------------+
| typname   | typcategory |
|-----------|-------------|
| dayofweek | E           |
+-----------+-------------+
```

Getting information about user-defined data types

```
SELECT column_name, data_type, udt_name
FROM INFORMATION_SCHEMA.COLUMNS
WHERE table_name ='film';
```

```
+-------------------------------------------+
| column_name | data_type         | udt_name    |
|-------------|-------------------|-------------|
| title       | character varying | varchar     |
| rating      | USER-DEFINED      | mpaa_rating |
+-------------------------------------------+
```

User-defined functions

```
CREATE FUNCTION squared(i integer) RETURNS integer AS $$
    BEGIN
        RETURN i * i;
    END;
$$ LANGUAGE plpgsql;
```

```
SELECT squared(10);
```

```
+---------+
| squared |
|---------|
| 100     |
+---------+
```

User-defined functions in the Sakila database

- **get_customer_balance(customer_id, effective_data):** calculates the current outstanding balance for a given customer.
- **inventory_held_by_customer(inventory_id):** returns the customer_id that is currently renting an inventory item or null if it's currently available.
- **inventory_in_stock(inventory_id):** returns a boolean value of whether an inventory item is currently in stock.

Let's practice!

FUNCTIONS FOR MANIPULATING DATA IN POSTGRESQL

Intro to PostreSQL extensions

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Intro to PostgreSQL extensions

Commonly used extensions

- PostGIS
- PostPic
- fuzzystrmatch
- pg_trgm

Querying extension meta data

Available Extensions

```
SELECT name
FROM pg_available_extensions;
```

```
+--------------------+
| name               |
|--------------------|
| dblink             |
| pg_stat_statements |
+--------------------+
```

Installed Extensions

```
SELECT extname
FROM pg_extension;
```

```
+----------+
| name     |
|----------|
| plpgsql  |
+----------+
```

```
--Enable the fuzzystrmatch extension
CREATE EXTENSION IF NOT EXISTS fuzzystrmatch;
--Confirm that fuzzstrmatch has been enabled
SELECT extname FROM pg_extension;
```

```
+----------------+
| name           |
|----------------|
| plpgsql        |
| fuzzystrmatch  |
+----------------+
```

Using fuzzystrmatch or fuzzy searching

```
SELECT levenshtein('GUMBO', 'GAMBOL');
```

```
+-------------+
| levenshtein |
|-------------|
|           2 |
+-------------+
```

Compare two strings with pg_trgm

```
SELECT similarity('GUMBO', 'GAMBOL');
```

```
+------------+
| similarity |
|------------|
| 0.18181818 |
+------------+
```

Let's practice!

FUNCTIONS FOR MANIPULATING DATA IN POSTGRESQL

Putting it All Together

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Functions for manipulating data recap and review

- Common data types in PostgreSQL
- Date/time functions and operators
- Parsing and manipulating text
- PostgreSQL Extensions and full-text search

Thank you!

FUNCTIONS FOR MANIPULATING DATA IN POSTGRESQL