HR Database

Business Scenario

Business requirement

The video game company saw explosive growth with a sudden appearance onto the gaming scene with its new AI-powered video game console. As a result, they went from a small 10 person operation to 200 employees and 5 locations in under a year. HR was having trouble keeping up with the growth since they were still maintaining employee information in a spreadsheet. While that worked for ten employees, it became increasingly cumbersome to manage as the company expands. As such, the HR department requested a database capable of managing their employee information.

Dataset

The HR dataset is an Excel workbook consisting of 206 records, with eleven columns. The data is in human-readable format and was not normalized at all. The data lists the names of employees, as well as information such as job title, department, manager's name, hire date, start date, end date, work location, and salary.

IT Department Best Practices

The IT Department has certain Best Practices policies for databases, as detailed in the Best Practices document.

Step 1

Business and Technical Requirement

Database Request

Hi,

As you may already know, we have recently experienced a lot of growth. Our AI powered video game console WOPR has been hugely successful and as a result, our company has grown from 10 employees to 200 in only 6 months (and we are projecting a 20% growth a year for the next 5 years). We have also grown from our Dallas, Texas office, to 4 other locations nationwide: New York City, NY, San Francisco, CA, Minneapolis, MN, and Nashville, TN.

While this growth is great, it is really starting to put a strain on our record keeping in HR. We currently maintain all employee information on a shared spreadsheet. When HR consisted of only myself, managing everyone on an Excel spreadsheet was simple, but now that it is a shared document I am having serious reservations about data integrity and data security. If the wrong person got their hands on the HR file, they would see the salaries of every employee in the company, all the way up to the president.

After speaking with the manager of IT, he suggested I put in a request to have my HR Excel file converted into a database. He suggested I reach out to you as I am told you have experience in designing and building databases. When you are building this, please keep in mind that I want any employee with a domain login to be have read only access the database. I just don't want them having access to salary information. That needs to be restricted to HR and management level employees only. Management and HR employees should also be the only ones with write access. By our current estimates, 90% of users will be read only.

I also want to make sure you know that am looking to turn my spreadsheet into a live database, one I can input and edit information into. I am not really concerned with reporting capabilities at the moment. Since we are working with employee data we are required by federal regulations to maintain this data for at least 7 years; additionally, since this is considered business critical data, we need to make sure it gets backed up properly.

As a final consideration. We would like to be able to connect with the payroll department's system in the future. They maintain employee attendance and paid time off information. It would be nice if the two systems could interface in the future

I am looking forward to working with you and seeing what kind of database you design for us.

Thanks,
Head of HR

Business Requirement

- **Purpose of the new database:**

  HR department wants to keep up with the growth of the company and ensure data integrity and security of the employee records.

- **Describe current data management solution:**

  Currently, all employee records are maintained on a shared Excel spreadsheet.

- **Describe current data available:**

  The current data consists of 206 records, with eleven columns, including the names of employees, job title, department, manager's name, hire date, start date, end date, work location, and salary.

- **Who will own/manage data**

  HR department will own and maintain the data.

- **Who will have access to database**

  Any employee with a domain login has read only access to the database. Management and HR employees also have write access.

- **Is any of the data sensitive/restricted**

  Salary information is restricted to management and HR employees.

Business Requirement

- **Estimated size of database**

  About 200 rows.

- **Estimated annual growth**

  For the next five years, HR projected a 20% annual growth. There are about 200 employees now. The projected growth will lead to the size of 500 employees at the end of year five.

- **Additional data requests:**

  There is a request to connect the HR database with the payroll database that maintains employee attendance and paid time off information.

Technical Requirement

- **Justification for the new database**

  The shared spreadsheet is not sufficient to keep up with the growth of the company. It also imposes data integrity and data security risks to the company. The new database will alleviate the strain of record keeping and improve the data integrity and data security.

- **Database objects**

  There are eight tables in the HR database, including Employee, Education, Job, Department, Location, Address, Salary, and Employee History.

- **Data ingestion**

  The data ingestion method will be ETL.

Technical Requirement

- **Data governance (Ownership and User access)**

  Ownership: HR will own and maintain the data.

  User Access: Any employee with a domain login has read only access to the database. Management and HR employees also have write access. Salary information is restricted to management and HR employees.

- **Scalability**

  Replication can be implemented if reporting or other reading needs arise. Sharding can be implemented to satisfy increased writing needs.

- **Flexibility**

  Define and document integration priorities and frequency.

  Monitor the integration process and put various check points

- **Storage & retention**

  Storage: 1GB partition on spinning disk

  Retention: at least 7 years required by federal regulations

- **Backup**

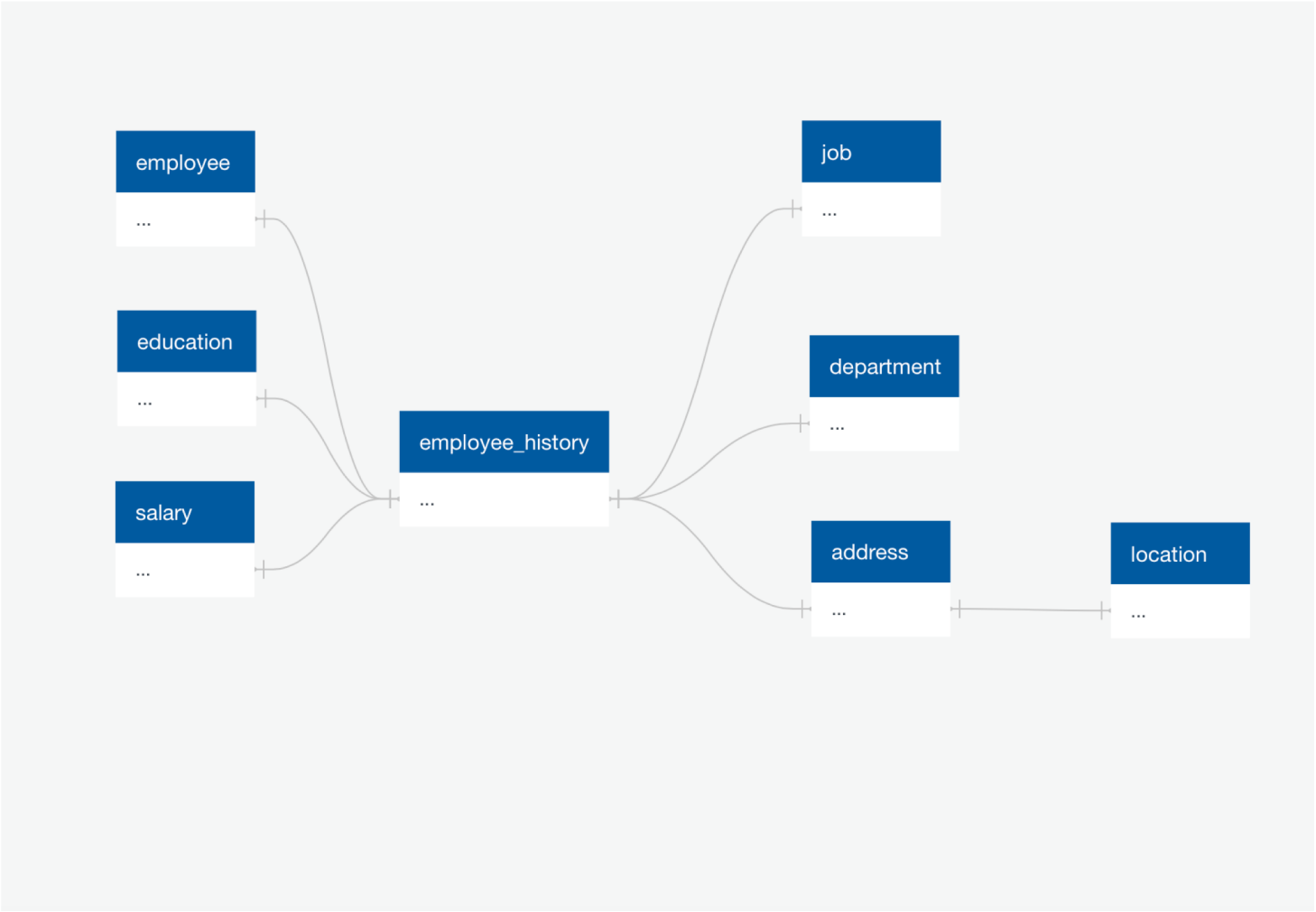
  The data is considered business critical. Backup schedule is full backup once per week and incremental backup daily.

Step 2

Relational Database Design

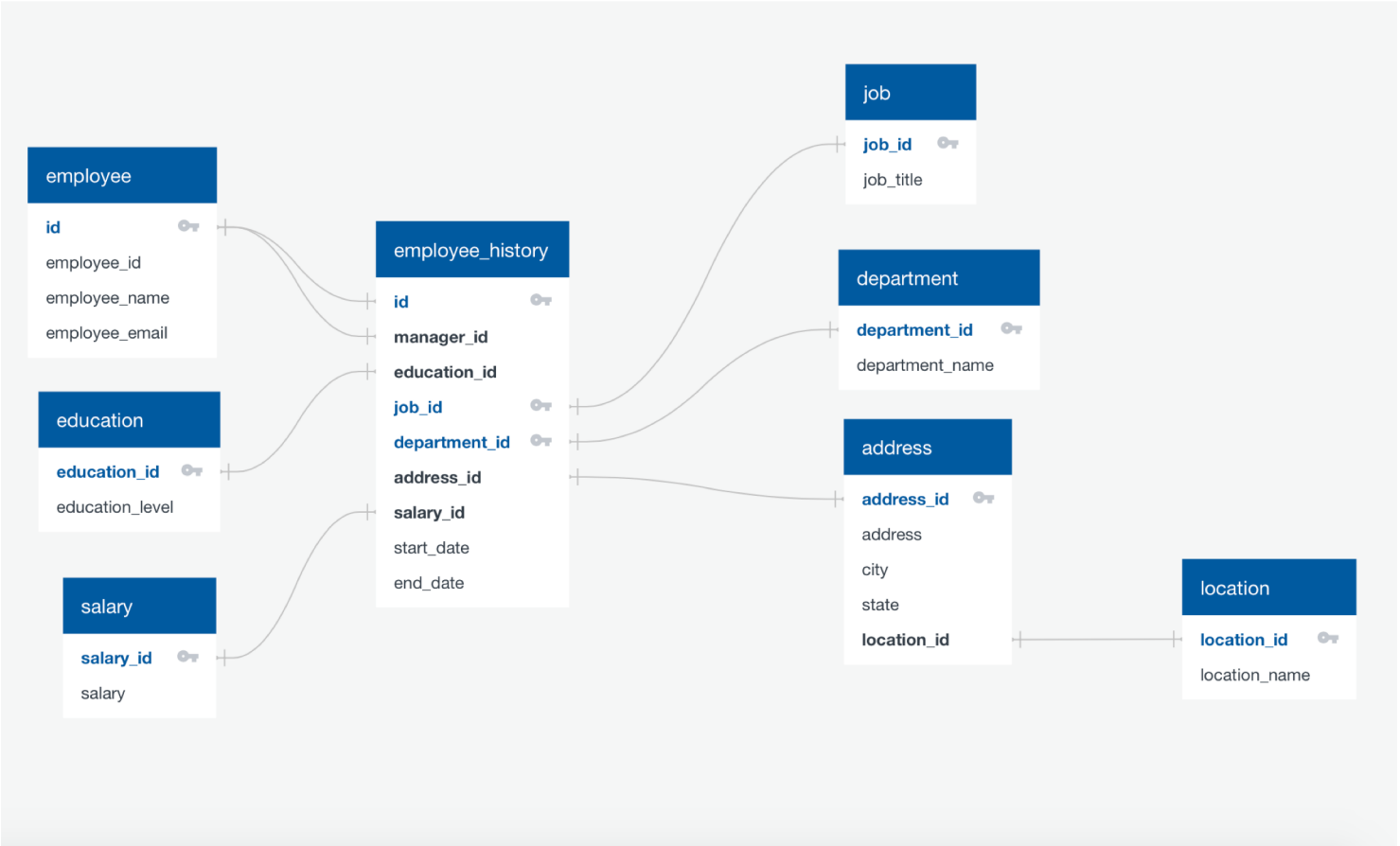
ERD

- **Conceptual**



ERD

- **Logical**


employee
id
employee_id
employee_name
employee_email
education
education_id
education_level
salary
salary_id
salary
employee_history
id
manager_id
education_id
job_id
department_id
address_id
salary_id
start_date
end_date
job
job_id
job_title
department
department_id
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address
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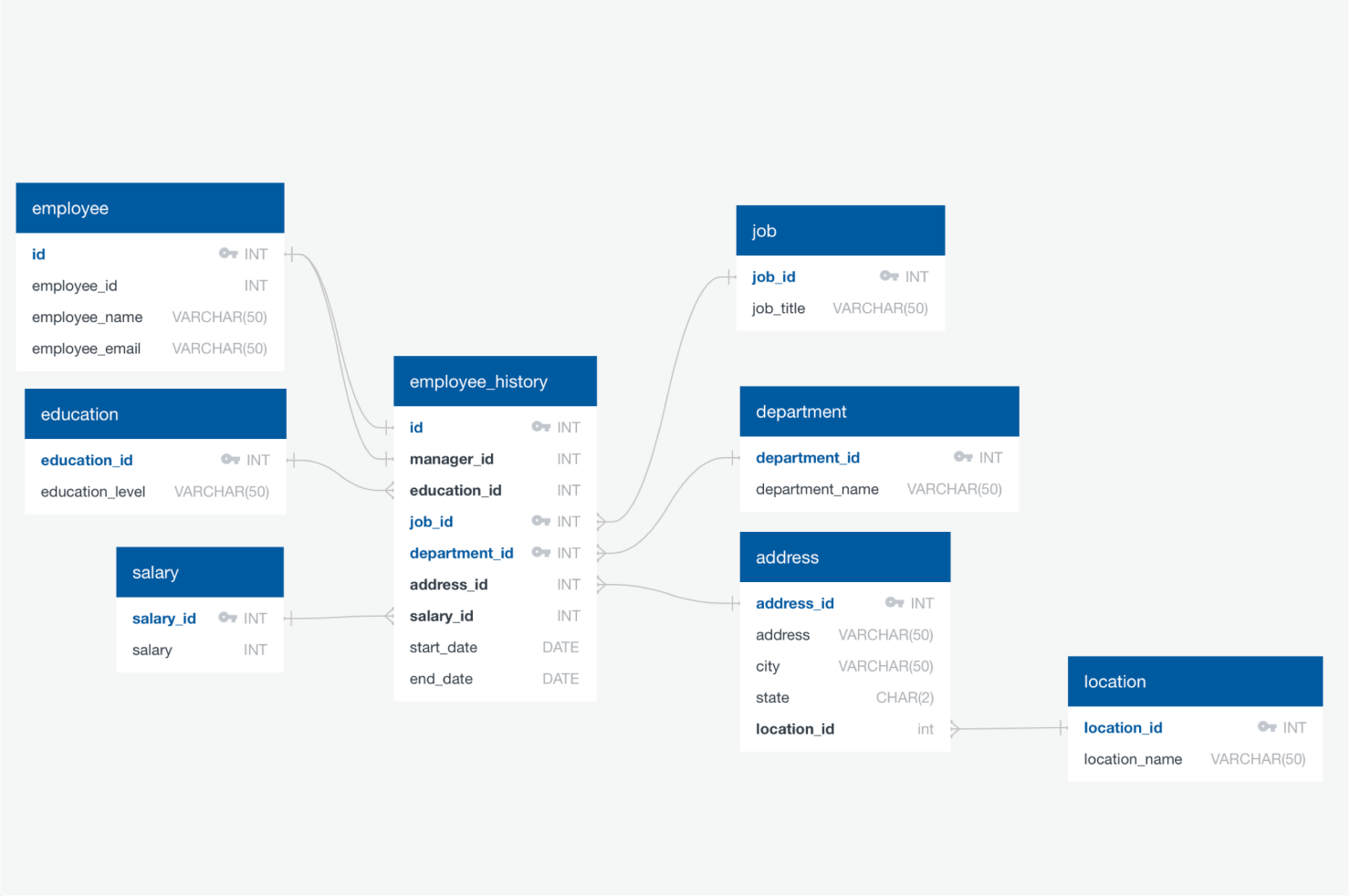
address
city
state
location_id
location
location_id
location_name

ERD

- **Physical**

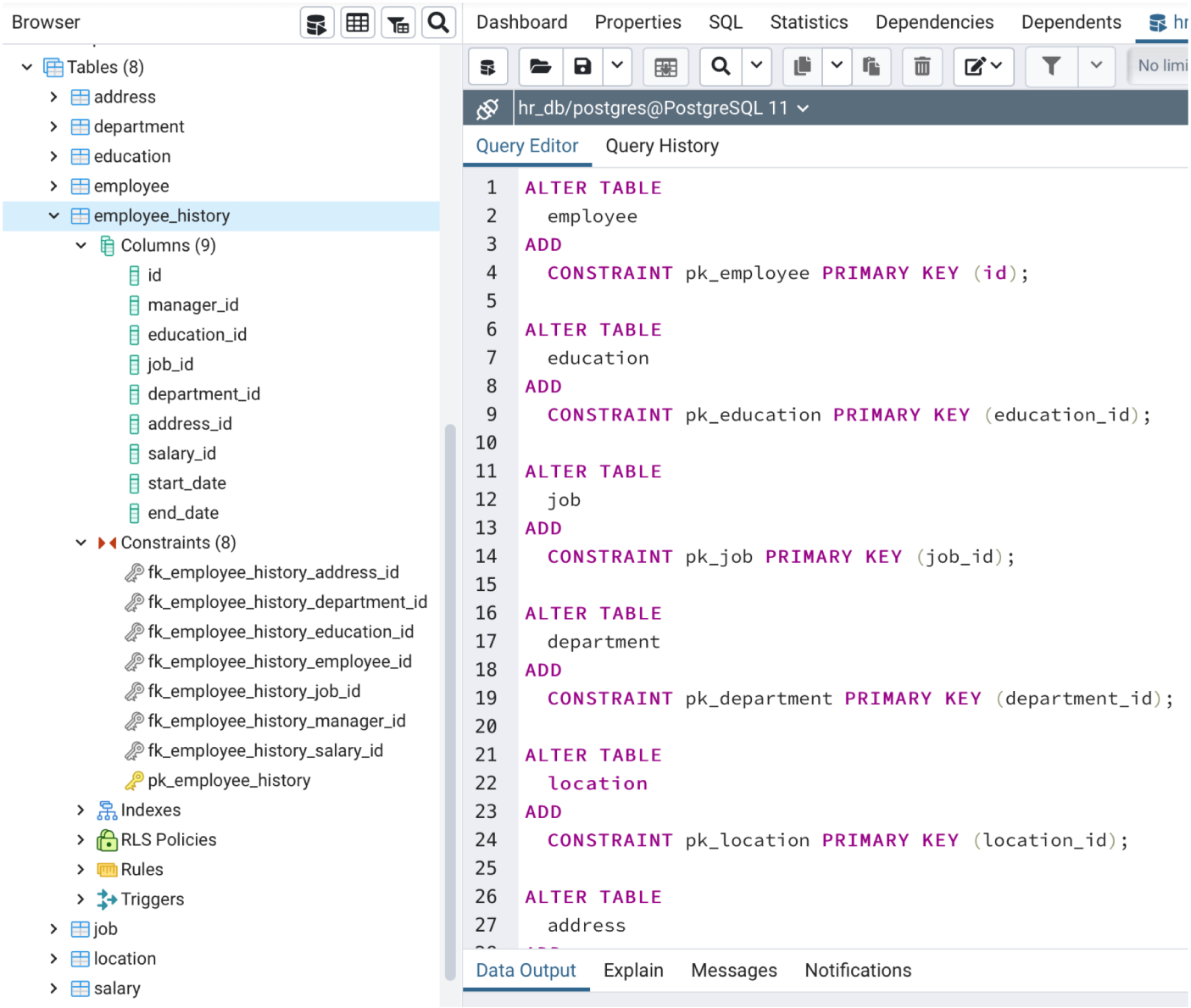


Step 3

Create A Physical Database

DDL

I used python for the ETL process and SQL script to add primary key and secondary key constraints.



CRUD

- **Query 1: Return a list of employees with Job Titles and Department Names**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  select
2    employee_name,
3    job,
4    department
5  from
6    employee_history h
7    join department d on h.department_id = d.department_id
8    join job j on h.job_id = j.job_id
9    join employee e on h.id = e.id
10 order by
11   employee_name
```

Data Output | Explain | Messages | Notifications

	employee_name text	job text	department text
1	Aaron Gordon	Network E...	Product Developm...
2	Aaron Richman	Administr...	Product Developm...
3	Abby Lockhart	Database ...	IT
4	Abby Lockhart	Network E...	IT
5	Alan Mecklet	Administr...	Product Developm...
6	Alejandro Scannapieco	Sales Rep	Sales
7	Alex Warring	Shipping ...	Distribution
8	Alexis Fitzpatrick	Administr...	IT
9	Allison Gentle	Manager	Distribution
10	Amit Hardiya	Administr...	Sales
11	Analyn Braza	Sales Rep	Sales
12	Andrew Yoon	Sales Rep	Product Developm...
13	Angela Masdary	Network E...	IT
14	Anil Padala	Software ...	Product Developm...
15	Anita Deluise	Administr...	HQ

CRUD

- **Query 2: Insert Web Programmer as a new job title**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  INSERT INTO job (job_id, job)
2  VALUES
3    (10, 'Web Programmer');
4
5  SELECT
6    *
7  FROM
8    job;
9
```

Data Output | Explain | Messages | Notifications

	job_id [PK] bigint	job text
1	0	Administrative Assi...
2	1	Database Administ...
3	2	Design Engineer
4	3	Legal Counsel
5	4	Manager
6	5	Network Engineer
7	6	President
8	7	Sales Rep
9	8	Shipping and Recei...
10	9	Software Engineer
11	10	Web Programmer

CRUD

- **Query 3: Correct the job title from web programmer to web developer**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  UPDATE
2    job
3  SET
4    job = 'Web Developer'
5  WHERE
6    job_id = 10;
7
8  SELECT
9    *
10 FROM
11   job;
12
```

Data Output | Explain | Messages | Notifications

	job_id [PK] bigint	job text
1	0	Administrative Assista...
2	1	Database Administrator
3	2	Design Engineer
4	3	Legal Counsel
5	4	Manager
6	5	Network Engineer
7	6	President
8	7	Sales Rep
9	8	Shipping and Receiving
10	9	Software Engineer
11	10	Web Developer

CRUD

- **Query 4: Delete the job title Web Developer from the database**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  DELETE FROM
2    job
3  WHERE
4    job_id = 10;
5  SELECT
6    *
7  FROM
8    job;
```

Data Output | Explain | Messages | Notifications

	job_id [PK] bigint	job text
1	0	Administrative Assistant
2	1	Database Administrator
3	2	Design Engineer
4	3	Legal Counsel
5	4	Manager
6	5	Network Engineer
7	6	President
8	7	Sales Rep
9	8	Shipping and Receiving
10	9	Software Engineer

CRUD

- **Query 5: How many employees are in each department?**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  SELECT
2    department,
3    COUNT(DISTINCT id) as employee_count
4  FROM
5    employee_history h
6    JOIN department d ON h.department_id = d.department_id
7  WHERE
8    end_date IS NULL
9  GROUP BY
10   department
11 ORDER BY
12   employee_count DESC
```

Data Output | Explain | Messages | Notifications

	department text	employee_count bigint
1	Product Development	69
2	IT	52
3	Sales	40
4	Distribution	25
5	HQ	13

CRUD

- **Query 6: Returns current and past jobs (include employee name, job title, department, manager name, start and end date for position) for employee Toni Lembeck.**

hr_db/postgres@PostgreSQL 11

Query Editor | Query History

```
1  SELECT
2    e1.employee_name,
3    j.job,
4    d.department,
5    e2.employee_name as manager_name,
6    h.start_date,
7    h.end_date
8  FROM
9    employee_history h
10   JOIN department d ON h.department_id = d.department_id
11   JOIN job j ON h.job_id = j.job_id
12   JOIN employee e1 ON h.id = e1.id
13   JOIN employee e2 ON h.manager_id = e2.id
14 WHERE
15   e1.employee_name = 'Toni Lembeck'
```

Data Output | Explain | Messages | Notifications

	employee_name text	job text	department text	manager_name text	start_date date	end_date date
1	Toni Lembeck	Databa...	IT	Jacob Lauber	2001-07-18	[null]
2	Toni Lembeck	Networ...	IT	Jacob Lauber	1995-03-12	2001-07-17

CRUD

- **Describe how to apply table security to restrict access to employee salaries using an SQL server.**

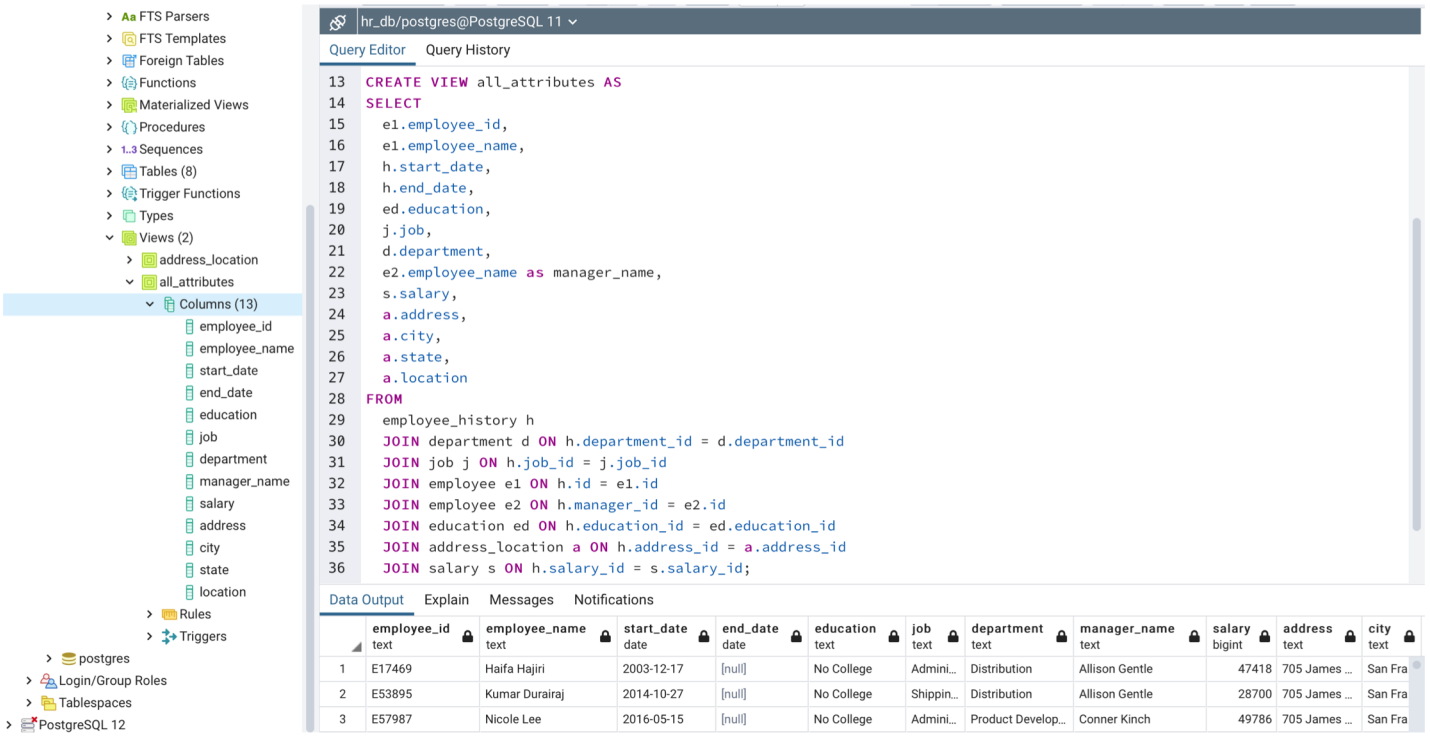
  Grant employees with a domain login read-only access to all tables in the HR Database and revoke access to the salary table for the employees who are not management or HR.

Step 4

Additional Features

Additional Feature 1

Create a view that returns all employee attributes.



Appendix