Database management project

DS 7330

**Fiber optics applications in the oil and gas**

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**Introduction**

I currently work for a fiber optics applications company called Silixa. Silixa provides fiber optics applications services to a wide variety of industries. Our oil and gas department in Houston deploy fiber optics cables to oil and gas wells and conduct various projects ranging across the progression of a well from seismic surveys to hydraulic fracturing monitoring to production monitoring. I wanted to leverage the power of database mamagement system to effectively organize the unstructured datat that I face day to day and have a clear understanding on the relations among the data. I used the Oracle SQL developer for this project.

**Data requirement and description**

The two most industry-leading technologies that we provide are DTS(Distributed Temperature Sensing and DAS(Distributed Acoustic Sensing). Each DTS and DAS interrogator sends down light down the fiber and measures temperature and strain based on how much light is backscattered. In case of a temperature and strain response that we see on our fiber from a nearby well operation, DTS and DAS catch those changes with the sensing interrogators.

Employee table contains general employee information such as start time, position, years with the company.

Project table contains Project ID, department name that handles this project, Client (ID) that is involved in this project, Profile indicating how important the specific project is, Job type indicating whether it is a crosswell frac or a production monitoring job, which are two main cutting-edge services that we provide.

Field data: Contains the following strain, temperature, pump data

* Strain data: Acoustic slow strain data
* Temperature data: Temperature measured in Fahrenheit degrees.
* Pump data: consists of timestamp, treating pressure(Pressure required to maintain pumping during fracking operation , slurry volume, and proppant concentration.

**ER schema**

**Diagram

Description automatically generated**

Assumptions : All the table inputs are closely related to each other as we work in a relatively close-knit company environment.(~50 employees total). Attributes of the field\_data table cannot have null entry as every information is necessary for data processing. The null exeption on employee table is that not everyone is involved in the project as the field engineers are the only ones that are deployed in the field and execute the project. Thus, only a small portion of the entire employees actually have data entries for their project assigned column. Clients are fully participating in the project as well as Field data is fully participated with the project.

Constraints

* Primary key in the employee table : E\_ID
* Primary Key in the field\_data : Time
* Primary key in the client : C\_ID
* Primary key in the Project: P\_ID

**P.K & F.K identification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ename | E\_ID | Dname | Start date | Position | Years\_with\_company |

Employee

P.K

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P\_ID | Dname | C\_ID | Profile | Job\_type | Duration |

Project.

P.K

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time | P\_ID | Dname | TR\_press | Slur | PPA | Strain | Temp |

Field\_data

P.K

x

|  |  |  |  |
| --- | --- | --- | --- |
| C\_ID | Cname | Service | Invoice |

Client

P.K

x

|  |  |
| --- | --- |
| P\_ID | Job\_type |

Job\_type

P.K

x

F.K

F.K

|  |  |
| --- | --- |
| E\_ID | P\_ID |

Involved\_in

P.K

x

F.K

F.K

|  |  |
| --- | --- |
| P\_ID | C\_name |

Requested\_by

P.K

x

F.K

F.K

|  |  |
| --- | --- |
| P\_ID | Time |

Provides

P.K

x

**Complex queries**

1. Find senior engineers who worked more than 3 years. Order by the ascending E\_ID as lower E\_ID means more seniority.

Graphical user interface, text, application

Description automatically generated

*Relational Algebra*

years\_with\_company>3 and position=’engineer’ (Employee)

1. During the Apache(client) operation, we noticed a strong acoustic response for thirty mins from 2:14:03pm to 2:44:03pm. Find the average temperature, treating pressure and strain.

Graphical user interface, text, application

Description automatically generated

*Relational Algebra*

R1🡪 time>16-oct-2020 14:14:03 and time<16-oct-2020 14:44:03  (Field\_data)

Temp,TR\_press,strain R1

1. Give me a list of employees that were assigned for either Exxonmobil or Apache job and its duration.

Table

Description automatically generated

*Relational Algebra*

project.c\_id=’2’or project.c\_id=’4’  (Employee A picture containing table, building, window, fence

Description automatically generatedemployee.p\_assigned=project.p\_id Project)

1. How much are we charging for service in total to WPX for all of WPX projects?

Graphical user interface, text, application

Description automatically generated

*Relational Algebra   
=>*  client.invoice\*project.duration (Client A picture containing table, building, window, fence

Description automatically generated client.C\_ID=project.C\_ID project)

1. Give me the name of the client that has the longest job duration.

Graphical user interface, text, application, email

Description automatically generated

*Relational Algebra*

R 🡪 Fmax(duration)(Project)

Cname (Client \* Project) natural join max(duration) R

**Stored procedure and function demonstration**

**[Function]**

**Q. Count the number of employees in the whole company**

**A picture containing text

Description automatically generated**

Unfortunately, this function could not be saved to the database due to the following error.

**Graphical user interface, text, application, email

Description automatically generated**

**[Procedure1]**

**Q. Take Employee name and years with company and put out a statement “Employee \_\_\_ has \_\_\_years with the company”**

**A picture containing graphical user interface, application

Description automatically generated**

Unfortunately, I could not save this stored procedure due to the following error.

Graphical user interface, text, application, email

Description automatically generated

**[Procedure2]**

Q. Write a procedure where I can add a new client information (Cname, C\_ID, service, and invoice) to the client table.

A picture containing graphical user interface

Description automatically generated

**[Trigger1]**

Q. Before inserting a new set of data row into the field\_data, trigger alert and record onto a table field\_data\_log. This is to ensure the new dataset is correctly entered.

Text

Description automatically generated

A picture containing graphical user interface

Description automatically generated

Result:

A picture containing table

Description automatically generated

**[Trigger2]**

Q. Before inserting a new set of data of an employee into the employee table, trigger an error alert when the employee has 2 years with the company. We have a bonus scheme for employees who worked 2 or more years. This is to ensure those with two more start getting bonuses starting on their second year with the company.

Graphical user interface, application

Description automatically generated

Result : It created an alert and inserted the following information

Table

Description automatically generated