

Fournigue Sefon

Class Project

CIDM 6350

## SEFSOR Technology company

### Section 1: Introduction

The selected domain for this database application is the technology sector, regrouping the administration of devices, software, service requests, and the orchestration of employees (users) and technicians within a technology-focused setting. This project revolves around SEFSOR, a tech startup with limited financial resources, which prevents them from employing full-time technicians. As a result, SEFSOR chooses to contract out their technical requirements that their IT department cannot service. In the technology sector, data mismanagement can lead to issues such as inefficient allocation of resources, security breaches, and disruptions in service delivery. These problems can result from inaccurate inventory records, lack of software licensing control, and user-technician coordination challenges. This database aims to address data mismanagement issues by ensuring data integrity, reducing data redundancy, and improving the overall efficiency and accuracy of managing technology-related assets and services.

Inaccurate or outdated inventory records can lead to inefficient resource allocation. For example, an organization may have a surplus of certain devices and a shortage of others, resulting in resource misalignment and wasted investments. Our database ensures real-time visibility into the availability and condition of technology assets, allowing for better allocation of resources and cost optimization. Information about devices is stored including the warranty expiry date.

Inadequate control over software licenses and device access can expose organizations to security risks. Unlicensed or unauthorized software installations may contain vulnerabilities or malware. SEFSOR's database ensures an adequate tracking of software licenses and that only authorized users can access and modify sensitive data, reducing the risk of security breaches. In our case, only IT people can order new software.

Service delivery disruptions can occur when users encounter technical issues and face delays in resolution. Poor coordination between users and technicians can lead to service disruptions and decreased productivity. Our database provides a structured system for tracking and resolving service requests efficiently. Employees can report issues, and technicians can be assigned quickly, reducing downtime and minimizing service disruptions.

Inaccurate records may result from missing or duplicate entries, incorrect asset details, or lack of update procedures. This can lead to confusion and errors in asset management. SEFSOR's

database unique identification for all entities, ensuring that asset information is accurate. This helps in efficient asset tracking and resource management.

Potential users of this database include IT administrators, Human resources, supervisors, and all other employees. These users can benefit from device and software management, efficient service request handling, and improved project and resource coordination. The database also provides detailed logs for troubleshooting and auditing purposes.

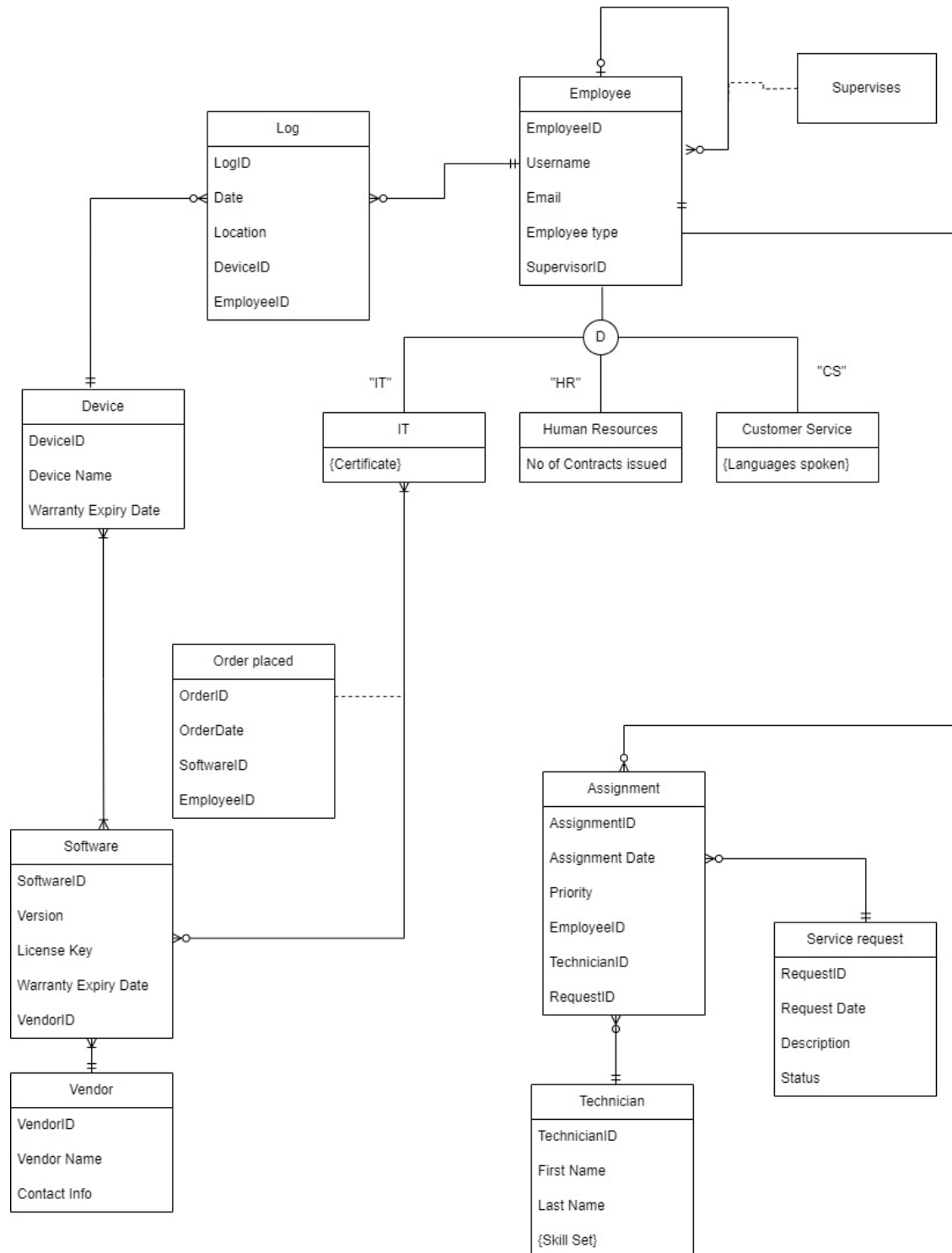
## Section 2: Business rules and user requirements

The database includes 13 entities that are Employee, Supervises, Log, Device, Order placed, Software, Vendor, IT, Human resources, Customer Services, Assignment, Service request, and Technician.

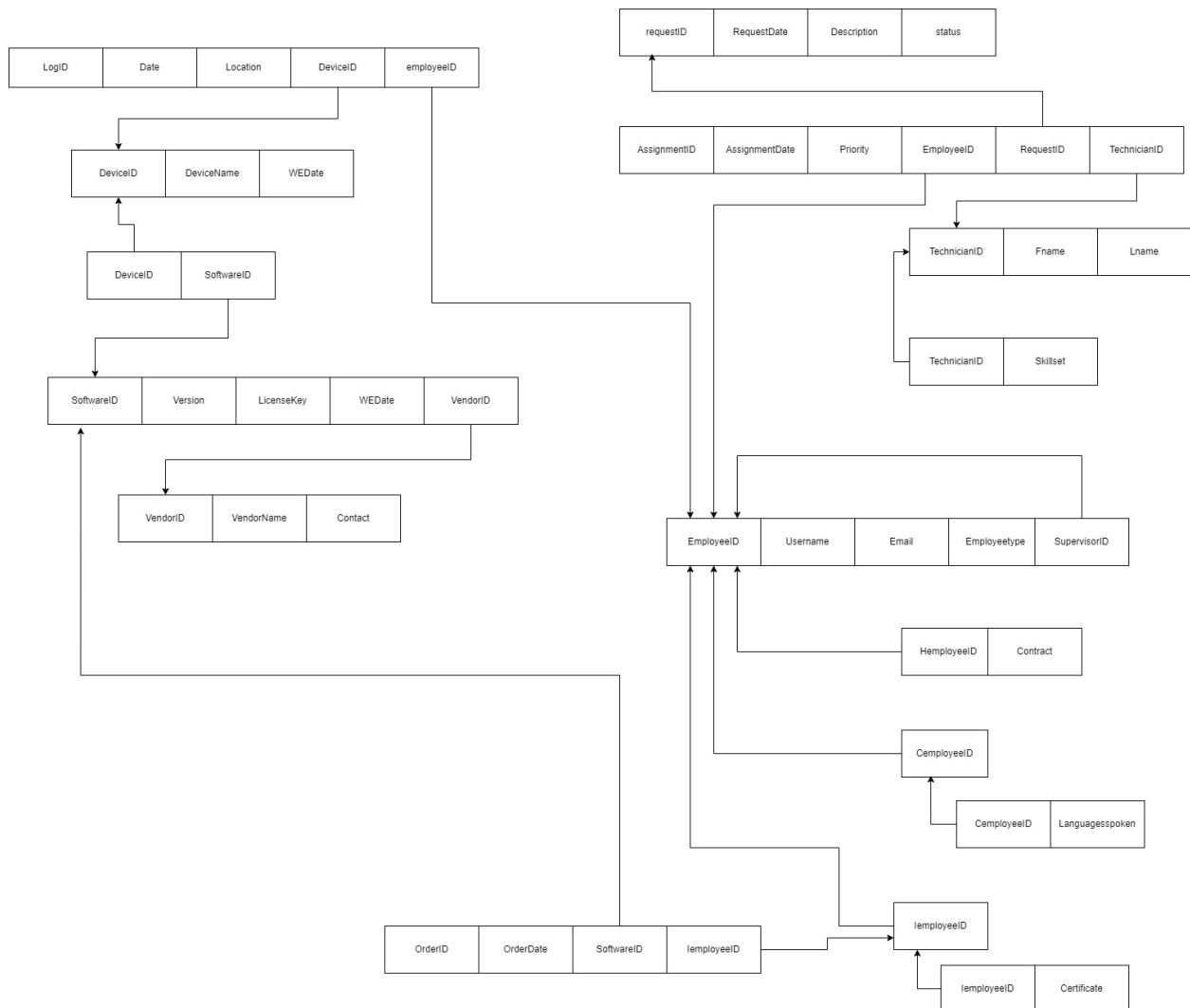
An employee can have the role of either supervisor or a supervisee. A supervisor can supervise none, one or many employees. An employee can have one supervisor at most to avoid uncertainty about who to report to. Some employees, especially the higher ranked, can have no supervisor. The employee entity should list EmployeeID, Username, Email and Employee type. Employee type refers to what department an employee works in. Example of types are IT employees who all have certificates, human resources who issue contracts, and customer service who are expected to speak different languages. Only IT people are allowed to order new software to ensure adequate control. When an order is placed, the orderID, date, softwareID and employeeID of the person ordering need to be stored. Software have unique identifiers. Their version, license key and warranty expiry date are always stored. To be considered a vendor, companies have to sell at least one software and a software cannot be provided by two different vendors. It is important to keep track of vendorID, name, and their contact. A software has to be installed on at least one device and a device should have at least one software to work properly. Every device has an ID, a name and a warranty expiry date. Every time an employee uses a device a log is kept including the logID, the date, the location, what device was used and who used it. An employee can have none or many logs but a log belongs to only one employee. The relationship between both is the same between device and log. SEFSOR usually contracts out outside technicians. It gives them unique identifiers and keeps information about their first name, last name and skillset. When a user requests a service, the request is assigned to a technician who works alone. The technician can have none, one or many assignment. For the service request, attributes of requestID, date, description of the request, and status are important. A service request will be pending if it has not been assigned yet and can include many assignments. An employee can need none, one or many assignments for their request but an assignment comes from only one employee. Because of the other three entities involved, the assignment entity needs to have an ID, a date, a priority level, an employeeID so we know who needs it, a

requestID so we know what request was made and technicianID so we know who will be working on it.

### Section 3: Enhanced entity relation diagram



## Section 4: Third normal form



## Section 5: SQL Tables

a- Creation

```
1 • DROP DATABASE IF EXISTS CIDM_6350;
2 • CREATE DATABASE CIDM_6350;
3 • USE CIDM_6350;
4
5 • CREATE TABLE employee(
6     employee_ID INT PRIMARY KEY,
7     first_name VARCHAR(20),
8     last_name VARCHAR(20),
9     username VARCHAR(50),
10    email VARCHAR(50),
11    employee_type VARCHAR(2),
12    supervisor_ID INT,
13    FOREIGN KEY (supervisor_ID) REFERENCES employee(employee_ID)
14 );
15
16 • CREATE TABLE service_request(
17     request_ID INT PRIMARY KEY,
18     request_date DATETIME,
19     description TEXT,
20     status VARCHAR(20) CHECK (status IN ('fulfilled', 'in process', 'failed'))
21 );
22
23 • CREATE TABLE technician(
24     technician_ID INT PRIMARY KEY,
25     first_name VARCHAR(20),
26     last_name VARCHAR(20)
27 );
28
29 • CREATE TABLE technician_skill(
30     technician_ID INT,
31     skillset VARCHAR(40),
32     PRIMARY KEY (technician_ID, skillset),
33     FOREIGN KEY (technician_id) REFERENCES technician(technician_ID)
34 );
35
36 • CREATE TABLE assignment(
37     assignment_ID INT PRIMARY KEY,
38     assignment_date DATETIME,
39     priority VARCHAR(20) CHECK (priority IN ('high', 'medium', 'low')),
40     employee_ID INT,
41     technician_ID INT,
42     request_ID INT,
43     FOREIGN KEY (employee_ID) REFERENCES employee(employee_ID),
44     FOREIGN KEY (technician_ID) REFERENCES technician(technician_ID),
45     FOREIGN KEY (request_ID) REFERENCES service_request(request_ID)
46 );
47
48 • CREATE TABLE infotech(
49     I_employee_ID INT PRIMARY KEY,
50     FOREIGN KEY (I_employee_ID) REFERENCES employee(employee_ID)
51 );
52
```

```
53 • ⊖ CREATE TABLE certificate(  
54     I_employee_ID INT,  
55     Certificate VARCHAR(100),  
56     PRIMARY KEY (I_employee_ID, certificate),  
57     FOREIGN KEY (I_employee_ID) REFERENCES infotech(I_employee_ID)  
58 );  
59  
60 • ⊖ CREATE TABLE human_resources(  
61     H_employee_ID INT PRIMARY KEY,  
62     number_contract INT,  
63     FOREIGN KEY (H_employee_ID) REFERENCES employee(employee_ID)  
64 );  
65  
66 • ⊖ CREATE TABLE customer_service(  
67     C_employee_ID INT PRIMARY KEY,  
68     FOREIGN KEY (C_employee_ID) REFERENCES employee(employee_ID)  
69 );  
70  
71 • ⊖ CREATE TABLE languages(  
72     C_employee_ID INT,  
73     language_spoken VARCHAR(100),  
74     PRIMARY KEY (C_employee_ID, language_spoken),  
75     FOREIGN KEY (C_employee_ID) REFERENCES customer_service(C_employee_ID)  
76 );  
77
```

```
78 • ⊖ CREATE TABLE device(  
79     device_ID INT PRIMARY KEY,  
80     device_name VARCHAR(20),  
81     warranty_date DATE  
82 );  
83  
84 • ⊖ CREATE TABLE vendor(  
85     vendor_ID INT PRIMARY KEY,  
86     vendor_name VARCHAR(20),  
87     contact VARCHAR(20)  
88 );  
89  
90 • ⊖ CREATE TABLE login(  
91     login_ID INT PRIMARY KEY,  
92     date DATE,  
93     location VARCHAR(20),  
94     employee_ID INT,  
95     device_ID INT,  
96     FOREIGN KEY (employee_ID) REFERENCES employee(employee_ID),  
97     FOREIGN KEY (device_ID) REFERENCES device(device_ID)  
98 );  
99
```

```
100 • ⊖ CREATE TABLE software(  
101     software_ID INT PRIMARY KEY,  
102     version_s VARCHAR(20),  
103     license_key BIGINT,  
104     warranty_date DATE,  
105     vendor_id INT,  
106     FOREIGN KEY (vendor_ID) REFERENCES vendor(vendor_ID)  
107 );  
108  
109 • ⊖ CREATE TABLE device_software(  
110     device_ID INT,  
111     software_ID INT,  
112     PRIMARY KEY (device_ID, software_ID),  
113     FOREIGN KEY (device_ID) REFERENCES device(device_ID),  
114     FOREIGN KEY (software_ID) REFERENCES software(software_ID)  
115 );  
116  
117 • ⊖ CREATE TABLE order_placed(  
118     order_ID INT PRIMARY KEY,  
119     order_date DATE,  
120     software_ID INT,  
121     employee_ID INT,  
122     FOREIGN KEY (software_ID) REFERENCES software(software_ID),  
123     FOREIGN KEY (employee_ID) REFERENCES employee(employee_ID)  
124 );
```

b- Insertion



```

127 • INSERT INTO employee (employee_ID, first_name, last_name, username, email, employee_type, supervisor_ID)
128 VALUES
129     (001, 'Ansu', 'Fati', 'Ansu_Fati', 'ansu.fati@example.com', 'IT', NULL),
130     (002, 'Alice', 'Smith', 'alice_smith', 'alice.smith@example.com', 'IT', 001),
131     (003, 'Bob', 'Jones', 'bob_jones', 'bob.jones@example.com', 'HR', 001),
132     (004, 'Emma', 'Wilson', 'emma_wilson', 'emma.wilson@example.com', 'HR', 002),
133     (005, 'Max', 'Miller', 'max_miller', 'max.miller@example.com', 'CS', 002);
134
135 • INSERT INTO service_request (request_ID, request_date, description, status)
136 VALUES
137     (0023, '2023-11-19 10:00:00', 'Software Installation', 'fulfilled'),
138     (0045, '2023-11-19 11:30:00', 'Hardware Repair', 'in process'),
139     (0044, '2023-11-19 13:45:00', 'Network Configuration', 'failed'),
140     (0056, '2023-11-19 15:20:00', 'Database Optimization', 'fulfilled'),
141     (0093, '2023-11-19 17:00:00', 'Security Audit', 'in process');
142
143 • INSERT INTO technician (technician_ID, first_name, last_name)
144 VALUES
145     (0091, 'Kyle', 'Smith'),
146     (0029, 'Mbappe', 'Johnson'),
147     (0093, 'Benzema', 'Williams'),
148     (0084, 'Messi', 'Jones'),
149     (0055, 'Ronaldo', 'Brown');
150

```

```

---
151 • INSERT INTO technician_skill (technician_ID, skillset)
152 VALUES
153     (0091, 'Programming'),
154     (0029, 'Network Administration'),
155     (0093, 'Database Management'),
156     (0084, 'Hardware Troubleshooting'),
157     (0055, 'Security Analysis');
158
159 • INSERT INTO assignment (assignment_ID, assignment_date, priority, employee_ID, technician_ID, request_ID)
160 VALUES
161     (100, '2023-11-19 10:30:00', 'high', 001, 0029, 0023),
162     (287, '2023-11-19 12:00:00', 'medium', 002, 0055, 0045),
163     (367, '2023-11-19 14:15:00', 'low', 001, 0084, 0056),
164     (455, '2023-11-19 16:30:00', 'high', 005, 0093, 0044),
165     (558, '2023-11-19 18:00:00', 'medium', 005, 0091, 0093);
166
167 • INSERT INTO infotech (I_employee_ID)
168 VALUES
169     (001);
170
171 • INSERT INTO certificate (I_employee_ID, Certificate)
172 VALUES
173     (001, 'CISSP'),
174     (001, 'Oracle Database Administrator Certified Associate (OCA)');
175

```

```
176 • INSERT INTO human_resources (H_employee_ID, number_contract)
177 VALUES
178     (002, 24),
179     (003, 10);
180
181 • INSERT INTO customer_service (C_employee_ID)
182 VALUES
183     (4),
184     (5);
185
186 • INSERT INTO languages (C_employee_ID, language_spoken)
187 VALUES
188     (4, 'German'),
189     (4, 'English'),
190     (5, 'English'),
191     (5, 'Mandarin');
192
193 • INSERT INTO device (device_ID, device_name, warranty_date)
194 VALUES
195     (024, 'Laptop1', '2023-12-31'),
196     (003, 'Desktop2', '2024-01-15'),
197     (018, 'Tablet3', '2023-11-25'),
198     (015, 'Phone4', '2023-12-10'),
199     (008, 'Printer5', '2024-02-01');
200
```

```

201 • INSERT INTO vendor (vendor_ID, vendor_name, contact)
202 VALUES
203     (001, 'Marshal Tech', '509-958-777'),
204     (045, 'Caprisun', '234-334-5342'),
205     (003, 'Ballon doree', '134-545-355'),
206     (015, 'Abidjan', '355-657-234'),
207     (016, 'Startend', '324-657-865');
208
209 • INSERT INTO login (login_ID, date, location, employee_ID, device_ID)
210 VALUES
211     (0023, '2023-05-19', 'Office1', 001, 003),
212     (0984, '2023-11-30', 'Home2', 002, 024),
213     (0894, '2023-11-14', 'Office3', 003, 008),
214     (0418, '2023-07-19', 'Home4', 004, 018),
215     (0415, '2023-07-19', 'Office5', 005, 015);
216
217 • INSERT INTO software (software_ID, version_s, license_key, warranty_date, vendor_id)
218 VALUES
219     (012, 'Bien', 123456, '2024-01-01', 001),
220     (015, 'Starline', 789012, '2023-12-31', 045),
221     (022, 'Trackone', 345678, '2024-02-15', 003),
222     (027, 'Tumblero', 901234, '2023-11-30', 015),
223     (001, 'TheSoftware', 567890, '2024-03-10', 016);
224
224
225 • INSERT INTO device_software (device_ID, software_ID)
226 VALUES
227     (008, 015),
228     (018, 027),
229     (003, 001),
230     (015, 022),
231     (024, 012);
232
233 • INSERT INTO order_placed (order_ID, order_date, software_ID, employee_ID)
234 VALUES
235     (009, '2023-04-01', 012, 001),
236     (026, '2023-08-06', 022, 001),
237     (027, '2023-08-06', 001, 002),
238     (034, '2023-11-19', 027, 002),
239     (041, '2023-11-06', 015, 001);
240

```

Section 6: Tables and records screenshots using DESC and SELECT commands.

```

243      -- Assignment Table
244 •   DESC assignment;
245 •   SELECT * FROM assignment;

```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

	Field	Type	Null	Key	Default	Extra
▶	assignment_ID	int	NO	PRI	NULL	
	assignment_date	datetime	YES		NULL	
	priority	varchar(20)	YES		NULL	
	employee_ID	int	YES	MUL	NULL	
	technician_ID	int	YES	MUL	NULL	
	request_ID	int	YES	MUL	NULL	

```

243      -- Assignment Table
244 •   DESC assignment;
245 •   SELECT * FROM assignment;

```

Result Grid | Filter Rows: | Edit: | Export/Import: |

	assignment_ID	assignment_date	priority	employee_ID	technician_ID	request_ID
▶	100	2023-11-19 10:30:00	high	1	29	23
	287	2023-11-19 12:00:00	medium	2	55	45
	367	2023-11-19 14:15:00	low	1	84	56
	455	2023-11-19 16:30:00	high	5	93	44
	558	2023-11-19 18:00:00	medium	5	91	93
*	NULL	NULL	NULL	NULL	NULL	NULL

```

247      -- Employee Table
248 •   DESC employee;
249 •   SELECT * FROM employee;
250
251      -- Infotech Table

```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

	Field	Type	Null	Key	Default	Extra
▶	employee_ID	int	NO	PRI	NULL	
	first_name	varchar(20)	YES		NULL	
	last_name	varchar(20)	YES		NULL	
	username	varchar(50)	YES		NULL	
	email	varchar(50)	YES		NULL	
	employee_type	varchar(2)	YES		NULL	
	supervisor_ID	int	YES	MUL	NULL	

```

247  -- Employee Table
248  •  DESC employee;
249  •  SELECT * FROM employee;
250
251  -- Infotech Table

```

Result Grid

Filter Rows:

Edit:

Export/Import:

Wrap Cell Content:

	employee_ID	first_name	last_name	username	email	employee_type	supervisor_ID
	1	Ansu	Fati	Ansu_Fati	ansu.fati@example.com	IT	NULL
	2	Alice	smith	alice_smith	alice.smith@example.com	IT	1
	3	Bob	Jones	bob_jones	bob.jones@example.com	HR	1
	4	Emma	Wilson	emma_wilson	emma.wilson@example.com	HR	2
	5	Max	Miller	max_miller	max.miller@example.com	CS	2
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL

```

252  •  DESC infotech;
253  •  SELECT * FROM infotech;
254
255  -- Certificate Table
256  •  DESC certificate;
257  •  SELECT * FROM certificate;

```

Result Grid

Filter Rows:

Export:

Wrap Cell Content:

	Field	Type	Null	Key	Default	Extra
▶	I_employee_ID	int	NO	PRI	NULL	

```

253  •  SELECT * FROM infotech;
254
255  -- Certificate Table
256  •  DESC certificate;
257  •  SELECT * FROM certificate;

```

Result Grid

Filter Rows:

Edit:

Export/Import

	I_employee_ID
▶	1
✱	NULL

```

255 -- Certificate Table
256 • DESC certificate;
257 • SELECT * FROM certificate;

```

Result Grid

Filter Rows:

Export:

Wrap Cell Content:

	Field	Type	Null	Key	Default	Extra
▶	I_employee_ID	int	NO	PRI	NULL	
	Certificate	varchar(100)	NO	PRI	NULL	

```

255 -- Certificate Table
256 • DESC certificate;
257 • SELECT * FROM certificate;

```

Result Grid	Filter Rows:	Edit:	Export:
I_employee_ID	Certificate		
1	CISSP		
1	Oracle Database Administrator Certified Associa...		
NULL	NULL		

```

259 -- Human Resources Table
260 • DESC human_resources;
261 • SELECT * FROM human_resources;
262
263 -- Customer Service Table

```

Result Grid

Filter Rows:

Export:

Wrap Cell Content:

	Field	Type	Null	Key	Default	Extra
▶	H_employee_ID	int	NO	PRI	NULL	
	number_contract	int	YES		NULL	

```

259      -- Human Resources Table
260 •   DESC human_resources;
261 •   SELECT * FROM human_resources;
262
263      -- Customer Service Table

```

Result Grid		Filter Rows: <input type="text"/>	Edit:	
	H_employee_ID	number_contract		
▶	2	24		
	3	10		
*	NULL	NULL		

```

264 •   DESC customer_service;
265 •   SELECT * FROM customer_service;
266
267      -- Languages Table
268 •   DESC languages;
269 •   SELECT * FROM languages;

```

Result Grid

Filter Rows:

Export:

Wrap Cell Content:

	Field	Type	Null	Key	Default	Extra
▶	C_employee_ID	int	NO	PRI	NULL	

```

265 •   SELECT * FROM customer_service;
266
267      -- Languages Table
268 •   DESC languages;
269 •   SELECT * FROM languages;

```

Result Grid		Filter Rows: <input type="text"/>	Edit:	
	C_employee_ID			
▶	4			
	5			
*	NULL			

```

267      -- Languages Table
268 •   DESC languages;
269 •   SELECT * FROM languages;
270
271      -- Device Table
272 •   DESC device;




```

Result Grid		Filter Rows:	Export:	Wrap Cell Content:	
Field	Type	Null	Key	Default	Extra
C_employee_ID	int	NO	PRI	NULL	
language_spoken	varchar(100)	NO	PRI	NULL	

```

267      -- Languages Table
268 •   DESC languages;
269 •   SELECT * FROM languages;
270
271      -- Device Table
272 •   DESC device;

```

Result Grid   Filter Rows:  Edit: 

	C_employee_ID	language_spoken
▶	4	English
	4	German
	5	English
	5	Mandarin
*	NULL	NULL

```

271      -- Device Table
272 •   DESC device;
273 •   SELECT * FROM device;
274
275      -- Vendor Table

```

Result Grid

Filter Rows:

Export:

Wrap Cell Content:


	Field	Type	Null	Key	Default	Extra
▶	device_ID	int	NO	PRI	NULL	
	device_name	varchar(20)	YES		NULL	
	warranty_date	date	YES		NULL	



```

271      -- Device Table
272 •    DESC device;
273 •    SELECT * FROM device;
274
275      -- Vendor Table


```

Result Grid			
Filter Rows: <input type="text"/>			
Edit: 			
	device_ID	device_name	warranty_date
▶	3	Desktop2	2024-01-15
	8	Printer5	2024-02-01
	15	Phone4	2023-12-10
	18	Tablet3	2023-11-25
	24	Laptop1	2023-12-31
•	NULL	NULL	NULL

```

275      -- Vendor Table
276 •    DESC vendor;
277 •    SELECT * FROM vendor;
278


```

Result Grid						
Filter Rows: <input type="text"/>						
Export:  Wrap Cell Content: <a href="#">IA</a>						
	Field	Type	Null	Key	Default	Extra
▶	vendor_ID	int	NO	PRI	NULL	
	vendor_name	varchar(20)	YES		NULL	
	contact	varchar(20)	YES		NULL	

```

275      -- Vendor Table
276 •    DESC vendor;
277 •    SELECT * FROM vendor;
278

```

Result Grid			
Filter Rows: <input type="text"/>			
Edit: 			
	vendor_ID	vendor_name	contact
▶	1	Marshal Tech	509-958-777
	3	Ballon doree	134-545-355
	15	Abidjan	355-657-234
	16	Startend	324-657-865
	45	Caprisun	234-334-5342
•	NULL	NULL	NULL

```

279      -- service request Table
280 •    DESC service_request;
281 •    SELECT * FROM service_request;
282
283      -- Login Table
284 •    DESC login;

```

Result Grid						
	Field	Type	Null	Key	Default	Extra
▶	request_ID	int	NO	PRI	NULL	
	request_date	datetime	YES		NULL	
	description	text	YES		NULL	
	status	varchar(20)	YES		NULL	

```

--
279      -- service request Table
280 •    DESC service_request;
281 •    SELECT * FROM service_request;
282
283      -- Login Table
284 •    DESC login;




```

Result Grid				
	request_ID	request_date	description	status
▶	23	2023-11-19 10:00:00	Software Installation	fulfilled
	44	2023-11-19 13:45:00	Network Configuration	failed
	45	2023-11-19 11:30:00	Hardware Repair	in process
	56	2023-11-19 15:20:00	Database Optimization	fulfilled
	93	2023-11-19 17:00:00	Security Audit	in process
*	NULL	NULL	NULL	NULL

```

283      -- Login Table
284      • DESC login;
285      • SELECT * FROM login;
286
287      -- Software Table

```



Result Grid		Filter Rows:	<input type="text"/>	Export:		Wrap Cell Content:	
	Field	Type	Null	Key	Default	Extra	
▶	login_ID	int	NO	PRI	NULL		
	date	date	int		NULL		
	location	varchar(20)	YES		NULL		
	employee_ID	int	YES	MUL	NULL		
	device_ID	int	YES	MUL	NULL		




```

283      -- Login Table
284      • DESC login;
285      • SELECT * FROM login;
286
287      -- Software Table

```

Result Grid

  Filter Rows:

Edit:   

	login_ID	date	location	employee_ID	device_ID
▶	23	2023-05-19	Office1	1	3
	415	2023-07-19	Office5	5	15
	418	2023-07-19	Home4	4	18
	894	2023-11-14	Office3	3	8
	984	2023-11-30	Home2	2	24
•	NULL	NULL	NULL	NULL	NULL

```

287 -- Software Table
288 • DESC software;
289 • SELECT * FROM software;
290
291 -- Device Software Table
292 • DESC device_software;
293 • SELECT * FROM device_software;

```

Field	Type	Null	Key	Default	Extra
software_ID	int	NO	PRI	NULL	
version_s	varchar(20)	YES		NULL	
license_key	bigint	YES		NULL	
warranty_date	date	YES		NULL	
vendor_id	int	YES	MUL	NULL	

```

287 -- Software Table
288 • DESC software;
289 • SELECT * FROM software;
290
291 -- Device Software Table
292 • DESC device_software;
293 • SELECT * FROM device_software;


```

software_ID	version_s	license_key	warranty_date	vendor_id
1	TheSoftware	567890	2024-03-10	16
12	Bien	123456	2024-01-01	1
15	Starline	789012	2023-12-31	45
22	Trackone	345678	2024-02-15	3
27	Tumblero	901234	2023-11-30	15
NULL	NULL	NULL	NULL	NULL

```

291      -- Device Software Table
292 •   DESC device_software;
293 •   SELECT * FROM device_software;
294
295      -- Technician Table
296 •   DESC technician;

```



Result Grid  Filter Rows:  Export:  Wrap Cell Content: 

	Field	Type	Null	Key	Default	Extra
▶	device_ID	int	NO	PRI	NULL	
	software_ID	int	NO	PRI	NULL	

```

291      -- Device Software Table
292 •   DESC device_software;
293 •   SELECT * FROM device_software;
294
295      -- Technician Table
296 •   DESC technician;

```

Result Grid   Filter Rows:  Edit:    Exp

	device_ID	software_ID
▶	3	1
	24	12
	8	15
	15	22
	18	27
*	NULL	NULL

```

295      -- Technician Table
296 •   DESC technician;
297 •   SELECT * FROM technician;
298
299      -- technician skill Table

```

Result Grid  Filter Rows:  Export:  Wrap Cell Content: 

	Field	Type	Null	Key	Default	Extra
▶	technician_ID	int	NO	PRI	NULL	
	first_name	varchar(20)	YES		NULL	
	last_name	varchar(20)	YES		NULL	

```

295      -- Technician Table
296      • DESC technician;
297      • SELECT * FROM technician;
298
299      -- technician skill Table

```

Result Grid  Filter Rows:  Edit: 

	technician_ID	first_name	last_name
▶	29	Mbappe	Johnson
	55	Ronaldo	Brown
	84	Messi	Jones
	91	Kyle	Smith
	93	Benzema	Williams
*	NULL	NULL	NULL

```

299      -- technician skill Table
300      • DESC technician_skill;
301      • SELECT * FROM technician_skill;
302
303      -- Order Placed Table
304      • DESC order_placed;
305      • SELECT * FROM order_placed;

```

Result Grid  Filter Rows:  Export:  Wrap Cell Co

	Field	Type	Null	Key	Default	Extra
▶	technician_ID	int	NO	PRI	NULL	
	skillset	varchar(40)	NO	PRI	NULL	

```

299 -- technician skill Table
300 • DESC technician_skill;
301 • SELECT * FROM technician_skill;
302
303 -- Order Placed Table
304 • DESC order_placed;
305 • SELECT * FROM order_placed;

```

Result Grid	Filter Rows:	Edit:
technician_ID	skillset	
29	Network Administration	
55	Security Analysis	
84	Hardware Troubleshooting	
91	Programming	
93	Database Management	
* NULL	NULL	

```

303 -- Order Placed Table
304 • DESC order_placed;
305 • SELECT * FROM order_placed;

```

Result Grid

Filter Rows:

Export:






Wrap Cell Content:

	Field	Type	Null	Key	Default	Extra
▶	order_ID	int	NO	PRI	NULL	
	order_date	date	YES		NULL	
	software_ID	int	YES	MUL	NULL	
	employee_ID	int	YES	MUL	NULL	

```

303 -- Order Placed Table
304 • DESC order_placed;
305 • SELECT * FROM order_placed;

```

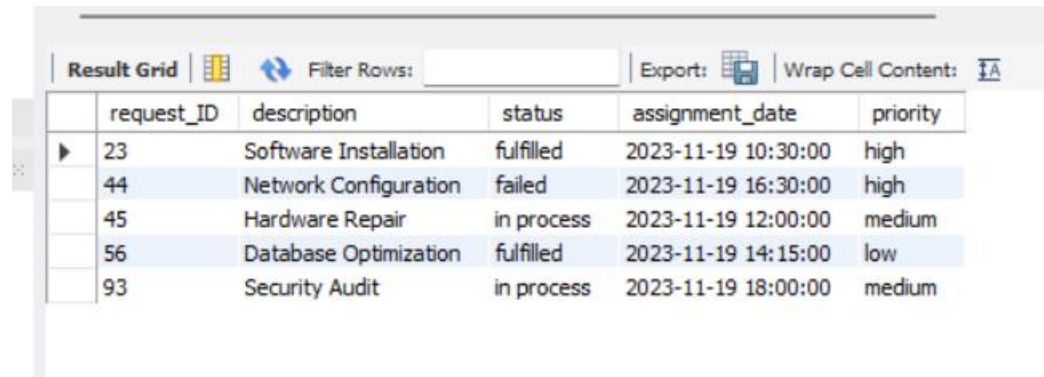
Result Grid |   Filter Rows:  | Edit:    | B

	order_ID	order_date	software_ID	employee_ID
▶	9	2023-04-01	12	1
	26	2023-08-06	22	1
	27	2023-08-06	1	2
	34	2023-11-19	27	2
	41	2023-11-06	15	1
•	NULL	NULL	NULL	NULL

## Section 7: SQL Queries and screenshots

-- Retrieve the Names and Status of Service Requests with Their Assignments:

- ```
SELECT sr.request_ID, sr.description, sr.status, a.assignment_date, a.priority
FROM service_request sr
LEFT JOIN assignment a ON sr.request_ID = a.request_ID;
```

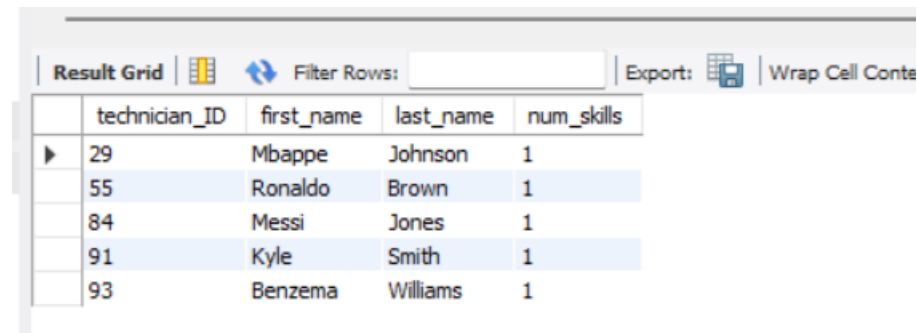


The screenshot shows a SQL query result grid with the following data:

|   | request_ID | description           | status     | assignment_date     | priority |
|---|------------|-----------------------|------------|---------------------|----------|
| ▶ | 23         | Software Installation | fulfilled  | 2023-11-19 10:30:00 | high     |
|   | 44         | Network Configuration | failed     | 2023-11-19 16:30:00 | high     |
|   | 45         | Hardware Repair       | in process | 2023-11-19 12:00:00 | medium   |
|   | 56         | Database Optimization | fulfilled  | 2023-11-19 14:15:00 | low      |
|   | 93         | Security Audit        | in process | 2023-11-19 18:00:00 | medium   |

-- Find the Number of Technicians with Their Skills:

```
SELECT t.technician_ID, t.first_name, t.last_name, COUNT(ts.skillset) AS num_skills
FROM technician t
LEFT JOIN technician_skill ts ON t.technician_ID = ts.technician_ID
GROUP BY t.technician_ID, t.first_name, t.last_name;
```



The screenshot shows a SQL query result grid with the following data:

|   | technician_ID | first_name | last_name | num_skills |
|---|---------------|------------|-----------|------------|
| ▶ | 29            | Mbappe     | Johnson   | 1          |
|   | 55            | Ronaldo    | Brown     | 1          |
|   | 84            | Messi      | Jones     | 1          |
|   | 91            | Kyle       | Smith     | 1          |
|   | 93            | Benzema    | Williams  | 1          |



```
-- Calculate the Average Number of Certificates per Infotech Employee:
SELECT i.I_employee_ID, COUNT(c.Certificate) AS num_certificates
FROM infotech i
LEFT JOIN certificate c ON i.I_employee_ID = c.I_employee_ID
GROUP BY i.I_employee_ID;
```

| Result Grid  |               |                  |
|--------------|---------------|------------------|
| Filter Rows: |               |                  |
|              | I_employee_ID | num_certificates |
| ▶            | 1             | 2                |



```
326 -- Retrieve Employee Assignments with Assigned Technicians and Service Request Details:
327 • SELECT e.employee_ID, e.username, a.assignment_ID, a.assignment_date, a.priority,
328         t.technician_ID, t.first_name AS technician_first_name, t.last_name AS technician_last_name,
329         sr.request_ID, sr.request_date, sr.description, sr.status
330 FROM employee e
331 LEFT JOIN assignment a ON e.employee_ID = a.employee_ID
332 LEFT JOIN technician t ON a.technician_ID = t.technician_ID
333 LEFT JOIN service_request sr ON a.request_ID = sr.request_ID;
```

| Result Grid                   |             |             |               |                     |          |               |                       |                      |            |                     |
|-------------------------------|-------------|-------------|---------------|---------------------|----------|---------------|-----------------------|----------------------|------------|---------------------|
| Filter Rows:                  |             |             |               |                     |          |               |                       |                      |            |                     |
| Exports:   Wrap Cell Content: |             |             |               |                     |          |               |                       |                      |            |                     |
|                               | employee_ID | username    | assignment_ID | assignment_date     | priority | technician_ID | technician_first_name | technician_last_name | request_ID | request_date        |
| ▶                             | 1           | Ansu_Fati   | 100           | 2023-11-19 10:30:00 | high     | 29            | Mbappe                | Johnson              | 23         | 2023-11-19 10:00:00 |
|                               | 1           | Ansu_Fati   | 367           | 2023-11-19 14:15:00 | low      | 84            | Messi                 | Jones                | 56         | 2023-11-19 15:20:00 |
|                               | 2           | alice_smith | 287           | 2023-11-19 12:00:00 | medium   | 55            | Ronaldo               | Brown                | 45         | 2023-11-19 11:30:00 |
|                               | 3           | bob_jones   | NUL           | NUL                 | NUL      | NUL           | NUL                   | NUL                  | NUL        | NUL                 |
|                               | 4           | emma_wilson | NUL           | NUL                 | NUL      | NUL           | NUL                   | NUL                  | NUL        | NUL                 |
|                               | 5           | max_miller  | 455           | 2023-11-19 16:30:00 | high     | 93            | Benzema               | Williams             | 44         | 2023-11-19 13:45:00 |
|                               | 5           | max_miller  | 558           | 2023-11-19 18:00:00 | medium   | 91            | Kyle                  | Smith                | 93         | 2023-11-19 17:00:00 |

```
-- Find the Total Number of Devices and the Average Warranty Period:
SELECT COUNT(device_ID) AS total_devices, AVG(DATEDIFF(warranty_date, CURDATE())) AS avg_warranty_days
FROM device;
```

| Result Grid  |               |                   |
|--------------|---------------|-------------------|
| Filter Rows: |               |                   |
|              | total_devices | avg_warranty_days |
| ▶            | 5             | 39.0000           |

```
-- List Employees, employee types and the Total number of software they ordered:
SELECT e.employee_ID, e.username, e.employee_type, op.software_ID, COUNT(op.order_ID) AS total_orders
FROM employee e
LEFT JOIN order_placed op ON e.employee_ID = op.employee_ID
GROUP BY e.employee_ID, e.username, e.employee_type, op.software_ID;
```

| Result Grid                                                                                                                                                                                      |             |             |               |             |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|---------------|-------------|--------------|
| Filter Rows: <input type="text"/>                                                                                                                                                                |             |             |               |             |              |
| Export:  Wrap Cell Content:  |             |             |               |             |              |
|                                                                                                                                                                                                  | employee_ID | username    | employee_type | software_ID | total_orders |
| ▶                                                                                                                                                                                                | 1           | Ansu_Fati   | IT            | 12          | 1            |
|                                                                                                                                                                                                  | 1           | Ansu_Fati   | IT            | 22          | 1            |
|                                                                                                                                                                                                  | 1           | Ansu_Fati   | IT            | 15          | 1            |
|                                                                                                                                                                                                  | 2           | alice_smith | IT            | 1           | 1            |
|                                                                                                                                                                                                  | 2           | alice_smith | IT            | 27          | 1            |
|                                                                                                                                                                                                  | 3           | bob_jones   | HR            | NULL        | 0            |
|                                                                                                                                                                                                  | 4           | emma_wilson | HR            | NULL        | 0            |
|                                                                                                                                                                                                  | 5           | max_miller  | CS            | NULL        | 0            |