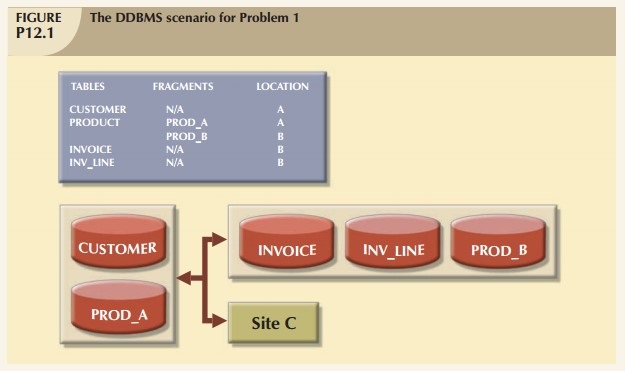
**Assignment-06**

**Distributed Database**

1. Given below is a Distributed database system. Specify the type of operation (remote request, remote transaction, distributed transaction, or distributed request) that the database must support to perform the following transactions. Also specify the reason in determining the type of database operation.



1. BEGIN;

SELECT prod\_code

FROM product

WHERE prod\_code = ‘A0555’;

COMMIT;

Ans. **Distributed request** (As product table is in 2 locations and we are accessing data from both the locations)

b. BEGIN.

SELECT inv\_line\_num

FROM in\_line;

SELECT inv\_num

FROM invoice;

COMMIT;

Ans**. Remote transaction** (As we are accessing data only from location B where INVOICE and INV\_LINE is located)

c. BEGIN;

SELECT cus\_ID

FROM customer;

COMMIT;

Ans**. Remote request** (As customer table is in one location and we are accessing data from customer table)

d. BEGIN;

UPDATE product

SET prod\_qoh = prod\_qoh – 1

WHERE prod\_num = ‘1111’;

COMMIT;

Ans**. Distributed request** (As we are updating data in product table where product table is in 2 locations)

e. BEGIN;

INSERT INTO invoice(inv\_num, cus\_num, inv\_date, inv\_total)

VALUES (‘999333’, ‘10000’, ‘15-MAR-2014’, 250);

INSERT INTO inv\_line(inv\_num, prod\_num, line\_price)

VALUES (‘999333’, ‘1001’, 200);

COMMIT;

Ans. **Remote transaction** (we are inserting data into INVOICE and IN\_LINE tables which are in only 1 location)

f. BEGIN;

UPDATE product

SET prod\_qoh = prod\_qoh – 1

WHERE prod\_num = ‘1111’;

UPDATE customer

SET cus\_bal = cus\_bal + 250

WHERE cus\_num = ‘10101’;

COMMIT;

Ans. **Distributed request** (As we are updating data from tables of product and customer which are in 2 locations)

g. BEGIN;

SELECT cus\_name

FROM customer;

SELECT inv\_num

FROM invoice;

COMMIT;

Ans. **Distributed transaction** (we are accessing data from 2 tables which are in 2 locations)

1. Suppose we have the following product data for a store in the database for a company with 3 warehouses.

An example table is as shown below.

**PART**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| AT94 | Iron | 50 | Home appliances | 3 | $524.95 |
| BV06 | Home Gym | 45 | Gym products | 2 | $ 794.95 |
| CD52 | Microwave Oven | 32 | Home appliances | 1 | $165.00 |
| DL71 | Cordless Drill | 21 | Home appliances | 3 | $129.95 |
| DR93 | Gas Range | 8 | Mechanical | 2 | $495.00 |
| DW11 | Washer | 12 | Mechanical | 3 | $399.00 |
| FD21 | Stand Mixer | 22 | Home appliances | 3 | $159.00 |
| KL62 | Dryer | 12 | Home appliances | 1 | $39.99 |
| KT03 | Dish washer | 8 | Home appliances | 3 | $595.00 |
| KV29 | Treadmill | 9 | Gym products | 2 | $1,390.00 |

a. Show how to fragment the above data horizontally by warehouse number. Call the fragments PART\_1, PART\_2 and PART\_3, and show the contents of each fragment.

**Ans.**

**PART\_1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| CD52 | Microwave Oven | 32 | Home appliances | 1 | $165.00 |
| KL62 | Dryer | 12 | Home appliances | 1 | $39.99 |

**PART\_2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| BV06 | Home Gym | 45 | Gym products | 2 | $ 794.95 |
| DR93 | Gas Range | 8 | Mechanical | 2 | $495.00 |
| KV29 | Treadmill | 9 | Gym products | 2 | $1,390.00 |

**PART\_3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| AT94 | Iron | 50 | Home appliances | 3 | $524.95 |
| DL71 | Cordless Drill | 21 | Home appliances | 3 | $129.95 |
| DW11 | Washer | 12 | Mechanical | 3 | $399.00 |
| FD21 | Stand Mixer | 22 | Home appliances | 3 | $159.00 |
| KT03 | Dish washer | 8 | Home appliances | 3 | $595.00 |

b. Next, you will fragment each fragment horizontally by class. Name each of the new fragments using the existing fragment name, followed by an underscore, followed by HOME\_APPLIANCES, GYM\_PRODUCTS and MECHANICAL.

**Ans.**

**PART\_1\_HOME\_APPLIANCES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| CD52 | Microwave Oven | 32 | Home appliances | 1 | $165.00 |
| KL62 | Dryer | 12 | Home appliances | 1 | $39.99 |

**PART\_2**\_ **GYM\_PRODUCTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| BV06 | Home Gym | 45 | Gym products | 2 | $ 794.95 |
| KV29 | Treadmill | 9 | Gym products | 2 | $1,390.00 |

**PART\_2**\_ **MECHANICAL**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| DR93 | Gas Range | 8 | Mechanical | 2 | $495.00 |

**PART\_3\_HOME\_APPLIANCES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| AT94 | Iron | 50 | Home appliances | 3 | $524.95 |
| DL71 | Cordless Drill | 21 | Home appliances | 3 | $129.95 |
| FD21 | Stand Mixer | 22 | Home appliances | 3 | $159.00 |
| KT03 | Dish washer | 8 | Home appliances | 3 | $595.00 |

**PART\_3\_MECHANICAL**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PartNum** | **Description** | **On Hand** | **Class** | **Warehouse** | **Price** |
| DW11 | Washer | 12 | Mechanical | 3 | $399.00 |

1. Consider the following situation, adapted from Date. A simplified procurement (relational) database has the following three relations:

SUPPLIER (SUPPLIER\_NUMBER, CITY) 40,000 records stored in Detroit

PART (PART\_NUMBER, COLOR) 650,000 records stored in Chicago

SHIPMENT (SUPPLIER\_NUMBER, PART\_NUMBER) 1,500,000 records stored in Detroit

A query is made (in SQL) to list the supplier numbers for Cleveland suppliers of red parts:

SELECT SUPPLIER.SUPPLIER\_NUMBER

FROM SUPPLIER, SHIPMENT, PART

WHERE SUPPLIER.CITY = ‘Cleveland’

AND SHIPMENT.PART\_NUMBER = PART.PART\_NUMBER

AND SHIPMENT.SUPPLIER\_NUMBER = SUPPLIER.SUPPLIER\_NUMBER

AND PART.COLOR = ‘RED’;

Each record in each relation is 350 characters long. There are thirty red parts, a history of 200,000 shipments from Cleveland, and a negligible query computation time compared with communication time. Also, there is a very old communication system with a very slow data transmission time of 4,000 characters per second and two seconds access delay to send a message from one node to another. Consider operating time to execute the query as three seconds. Assume the time taken to transfer the query results as negligible.

Determine the time to process this remote query assuming the following strategy:

**Move SUPPLIER relation to Chicago; then move SHIPMENT relation to Chicago; process whole query at Chicago computer.**

Answer should be expressed in hours, with one decimal place. **Note: *For the possibility of partial credit, show your work, i.e. how you came to your final answer.***

**Answer:**

* **SUPPLIER** relation has 40,000 records

**40,000 (records) \* 350 (characters long) = 14,000,000 characters to transmit**

**14,000,000 / 4000 (data transmission time in sec) = 3,500 seconds**

**2 second delay to send message from one node to other = 3,502 seconds**

* **SHIPMENT** relation has 1,500,000 records

**1,500,000 (records) \* 350 (characters long) = 525,000,000 characters to transmit**

**525,000,000 / 4000 (data transmission time in sec) = 1,31,250 seconds**

**2 second delay to send message from one node to other = 1,31,252 seconds**

* **processing whole query at Chicago computer**

**3,502 (Supplier) + 1,31,252 (Shipment) = 134,754 seconds**

**3 seconds to execute whole query = 134,757 seconds**

***Final Output: 37.4 hours***