**Physical Design**

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Part I: Data Types

Here, we specify the length of attributes with character data types (ex. VARCHAR2(32)), which helps to ensure data integrity and minimizes space usage. For numbers, we have the option to specify the scale and precision.

Part II: Indexes

In the bottom of each table (gray portion), indexes have been specified with their justifications. The end of the document includes a more detailed description and justification for choosing certain indexes.

----------Tables----------

| **Appointment** | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **Appointment_id** | NUMBER(5,0) | NOT NULL |
| Date | DATE | |
| time | TIMESTAMP | |
| deposit_fee | NUMBER | |
| **customer_customer_id** | NUMBER | NOT NULL |
| **employee_employee_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for appointment_id \| justification: primary key | | |

| **Availability** | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employee_employee_id** | NUMBER | NOT NULL |
| **timeslot_timeslot_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for employee_id and timeslot_id \| justification: primary foreign key | | |

| Customer | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **customer_id** | NUMBER | NOT NULL |
| name | VARCHAR2(100) | |
| **Indexes:** create unique index for customer_id \| justification: primary key; name for common searches | | |

| Emp_hourly | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employee_id** | NUMBER | NOT NULL |
| hourly_rate | NUMBER | NOT NULL |
| **Indexes:** create index for employee_id (common search) | | |

| Emp_salary | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employee_id** | NUMBER | NOT NULL |
| salary | NUMBER | NOT NULL |
| **Indexes:** create index for employee_id (common search) | | |

| Employee | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employee_id** | NUMBER | NOT NULL |
| **fname** | VARCHAR2(50) | NOT NULL |
| **lname** | VARCHAR2(50) | NOT NULL |
| employee_type_employeetypeid | NUMBER | |
| **Indexes:** create unique index for employee_id \| justification: primary key; fname and lname for common searches | | |

| Employee_type | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employeetypeid** | NUMBER | NOT NULL |
| name | VARCHAR2(32) | |
| description | VARCHAR2(100) | |
| **Indexes:** create unique index for employeetypeid \| justification: primary key | | |

| Offerings | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **offering_id** | NUMBER | NOT NULL |
| name | VARCHAR2(50) | |
| Desc | VARCHAR2(100) | |
| price | NUMBER | |
| **Indexes:** create unique index for offering_id \| justification: primary key | | |

| Payment | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| total_amount | NUMBER | |
| **customer_customer_id** | NUMBER | NOT NULL |
| **payment_id** | NUMBER | NOT NULL |
| payment_type | VARCHAR2(32) | |
| **Indexes:** create unique index for payment_id \| justification: primary key | | |

| Product | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **offering_id** | NUMBER | NOT NULL |
| **product_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for product_id \| justification: primary key | | |

| Purchase | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **payment_payment_id** | NUMBER | NOT NULL |
| **offerings_offering_id** | NUMBER | NOT NULL |
| quantity | NUMBER | |
| **Indexes:** create unique index for payment_payment_id, offerings_offering_id \| justification: primary keys | | |

| Schedule | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **schedule_id** | NUMBER | NOT NULL |
| **timeslot_timeslot_id** | NUMBER | NOT NULL |
| **employee_employee_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for schedule_id \| justification: primary key | | |

| Service | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **offering_id** | NUMBER | NOT NULL |
| **service_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for service_id \| justification: primary key | | |

| Services_provided | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **employee_employee_id** | NUMBER | NOT NULL |
| **service_offering_id** | NUMBER | NOT NULL |
| **Indexes:** | | |

| Services_requested | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| est_total_time | NUMBER | |
| **appointment_appointment_id** | NUMBER | NOT NULL |
| **service_service_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for est_total_time \| justification: may be searched a lot for making schedules and timetables | | |

| Supplier | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **supplier_id** | NUMBER | NOT NULL |
| name | VARCHAR2(100) | |
| **Indexes:** create unique index for supplier_id \| justification: primary key | | |

| Supply_order | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **order_id** | NUMBER | NOT NULL |
| **supplier_supplier_id** | NUMBER | NOT NULL |
| **delivery_date** | DATE | |
| **Indexes:** create unique index for order_id \| justification: primary key; delivery date for common searches | | |

| Supply_orderline | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **orderline_id** | NUMBER | NOT NULL |
| quantity | NUMBER | |
| purchase_price | NUMBER | |
| **supply_order_order_id** | NUMBER | NOT NULL |
| **product_product_id** | NUMBER | NOT NULL |
| **Indexes:** create unique index for orderline_id \| justification: primary key | | |

| Timeslot | | |
|---|---|---|
| **Attribute** | **Data Type** | **Constraint** |
| **timeslot_id** | NUMBER | NOT NULL |
| day_of_week | VARCHAR2(10) | |
| start_time | NUMBER | |
| end_time | NUMBER | |
| **Indexes:** create unique index for timeslot_id \| justification: primary key | | |

----------End Tables----------

Overview of data volume and usage analysis

| Table Name | Data Volume | High Traffic Table? |
|---|---|---|
| **Customers** | 10,000 | ✓ |
| **Employees (Total)** | 20 | |
| **Employee Hourly** | 18 | |
| **Employee Salary** | 2 | |
| **Employee Type** | 3 | |
| **Offerings** | 90 | |
| **Products** | 50 | |
| **Services** | 40 | |
| **Timeslot** | 15 | |
| **Schedule** | 100 | |
| **Supply OrderLine** | 500 | |
| **Supply Order** | 200 | |
| **Supplier** | 5 | |
| **Appointments** | 15,000 | ✓ |
| **Services Requested** | 20,000 | ✓ |
| **Payments** | 20,000 | ✓ |
| **Availability** | 200 | |
| **Services provided** | 100 | |
| **Purchase** | 25,000 | ✓ |

More on Indexes, data usage

Primary keys:
Timeslot_ID, Schedule_ID, Employee_ID, EmployeeTypeID, Offering ID, Orderline ID, Appointment_ID, Order_ID, Customer_ID, Payment ID, Supplier_ID

Frequently used in searches/WHERE clause + ORDER BY/GROUP BY:
Name in Customer (for finding a customer by name after or before an appointment)

FName & LName in Employee (for finding a specific employee by name; index can use both values/multivalued. May be useful for employee payments (such as checks or direct deposit where you may need the first and last name) checking who is on the weekly schedule to send out reminders without just the employee ID.)

Delivery Date in Supply Order (may want to search and see when the next delivery is, or find when the last supply order was delivered; also, if there is a problem such as a delay in the last delivery or missing products, you can find the supplier easily by searching through latest delivery date)

Frequent user actions:

- Editing or creating a timeslot – making a weekly schedule
- Creating or searching appointments
- Adding customers
- Adding a payment for an appointment or customer
- Searching availability for employees for a given week
- Paying an employee by determining their hours/appointments and pay per hour/commission for a given pay period
- Determining what employees can work for a given appointment (based on type and time)
- Scheduling supply orders
- Keeping track of how many supplies are available for a given time period

Bottlenecks:
Products / Supply OrderLine – there may be a significant wait for a given order to be delivered.
Supplier / Supply Order – there may be a wait for a supplier to supply/create a given order.
Customer / Appointment – there may be many customers wanting an appointment, but only a given amount of each type per week, causing a wait.