

Phase III: Logical Data Model Documentation

1. Normalization Justification (3NF)

The database schema is normalized to **Third Normal Form (3NF)** to ensure data integrity and reduce redundancy:

- **1NF (First Normal Form):** All columns are atomic and contain single values. There are no repeating groups. (e.g., Nurse specializations are singular or handled via valid defined types, and patient addresses are stored as complete atomic strings).
- **2NF (Second Normal Form):** All non-key attributes depend on the full Primary Key. In the BOOKINGS table, attributes like Status and Scheduled_Time depend entirely on the BOOKING_ID, not on a subset of any composite key.
- **3NF (Third Normal Form):** Transitive dependencies are removed. Patient details (like Address and DOB) are stored in the PATIENTS table, not repeated in the BOOKINGS table. Similarly, Service pricing is stored in SERVICES, ensuring that if a price changes, it is updated in one place only.

2. BI & Analytics Strategy

- **Fact Tables:** BOOKINGS (transactions), VISIT_LOGS (durations/execution), PAYMENTS (revenue).
- **Dimensions:** PATIENTS (demographics), NURSES (skills/ratings), SERVICES (categories).
- **Auditing:** AUDIT_LOGS tracks all INSERT/UPDATE actions on sensitive tables for compliance.

3. Data Dictionary

Assumptions: Currency is RWF. Timestamps are in CAT.

Table: USERS

Column	Data Type	Constraints	Description
user_id	NUMBER(10)	PK, NOT NULL	Unique System ID
username	VARCHAR2(50)	UNIQUE, NOT NULL	Login Name
role	VARCHAR2(20)	CHECK IN ('PATIENT', 'NURSE', 'ADMIN')	User Access Level

created_at	TIMESTAMP	DEFAULT SYSDATE	Account creation date
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Table: PATIENTS

Column	Data Type	Constraints	Description
user_id	NUMBER(10)	PK, FK	Link to Users
full_name	VARCHAR2(100)	NOT NULL	Patient Legal Name
dob	DATE	NOT NULL	Date of Birth
address	VARCHAR2(200)	NOT NULL	Home Location

Table: NURSES

Column	Data Type	Constraints	Description
user_id	NUMBER(10)	PK, FK	Link to Users
license_no	VARCHAR2(50)	UNIQUE, NOT NULL	Medical License ID
specialization	VARCHAR2(100)	NOT NULL	e.g., 'Wound Care'
rating	NUMBER(2,1)	DEFAULT 0	Avg Patient Rating (0-5)

Table: SERVICES

Column	Data Type	Constraints	Description
service_id	NUMBER(5)	PK, NOT NULL	Unique Service ID
name	VARCHAR2(100)	NOT NULL	e.g., 'Injection'
base_price	NUMBER(10,2)	CHECK > 0	Cost in RWF
duration_min	NUMBER(3)	NOT NULL	Est. Duration (mins)

Table: BOOKINGS

Column	Data Type	Constraints	Description
booking_id	NUMBER(10)	PK, NOT NULL	Unique Booking ID
patient_id	NUMBER(10)	FK	Requesting Patient
nurse_id	NUMBER(10)	FK	Assigned Nurse
service_id	NUMBER(5)	FK	Service Type
scheduled_time	TIMESTAMP	NOT NULL	Planned Visit Time
status	VARCHAR2(20)	DEFAULT 'PENDING'	Workflow State

Table: VISIT_LOGS

Column	Data Type	Constraints	Description
log_id	NUMBER(10)	PK, NOT NULL	Visit Record ID
booking_id	NUMBER(10)	FK	Link to Booking
actual_start	TIMESTAMP	NOT NULL	Nurse Arrival

actual_end	TIMESTAMP	NOT NULL	Nurse Departure
notes	VARCHAR2(1000)	NULL	Clinical Observations

Table: PAYMENTS

Column	Data Type	Constraints	Description
payment_id	NUMBER(10)	PK, NOT NULL	Transaction ID
booking_id	NUMBER(10)	FK	Link to Booking
amount	NUMBER(10,2)	NOT NULL	Amount Paid
method	VARCHAR2(20)	CHECK IN ('CASH', 'MOMO')	Payment Channel

Table: ADMIN_CONFIG

Column	Data Type	Constraints	Description
config_key	VARCHAR2(50)	PK	Setting Name
config_value	VARCHAR2(100)	NOT NULL	Setting Value
last_updated	DATE	NOT NULL	Timestamp of change

Table: AUDIT_LOGS

Column	Data Type	Constraints	Description

audit_id	NUMBER(10)	PK, NOT NULL	Log Entry ID
table_name	VARCHAR2(30)	NOT NULL	Modified Table
action	VARCHAR2(10)	CHECK IN ('INSERT', 'UPDATE')	Operation Type
change_date	TIMESTAMP	DEFAULT SYSDATE	Audit Timestamp