Detailed Definitive Database Schema — Rwanda Reservation Marketplace (Prototype)

This schema is for **ASP.NET Core .NET 8 Minimal APIs + EF Core** (InMemory for now). It is **multi-tenant** (every business row carries TenantId) and optimized for the **reserve → confirm → pickup** flow.

1) Core Entities

1.1 Tenant (Mall)

Field	Type (C#)	Constraints	Rationale
Id	string	**PK**	Mall key, e.g., kigali-city-mall; used as FK across domain.
Name	string	Required	Display name.
Slug	string	Unique	URL-friendly identifier.
Location	string	Required	City/address (e.g., "Kigali, Rwanda").
ContactEmail	string?	Optional	Mall operator contact.
TimeZone	string	Required	e.g., Africa/Kigali; supports correct expiry logic.
DefaultExpiryHours	int	Required	e.g., 24; used to compute Reservation.ExpiresAt.
CreatedAt	DateTimeOffset	Required	Creation timestamp.

1.2 Vendor (Store)

Field	Type (C#)	Constraints	Rationale
Id	Guid	**PK**	Store identifier.
TenantId	string	**FK → Tenant**	Enforces mall scoping.
DisplayName	string	Required	Customer-facing store name.
LegalName	string	Required	Contract/invoicing.
StoreLocation	string?	Optional	Mall location (e.g., "Floor 2, Shop 15").
ContactPhone	string	Required	Primary phone.
ContactEmail	string?	Optional	Optional email contact.
Active	bool	Required (default: true)	Visibility toggle.
Verified	bool	Required (default: false)	Internal verification flag.

Field	Type (C#)	Constraints	Rationale
CreatedAt	DateTimeOffset	Required	Row creation timestamp.

1.3 Customer

Field	Type (C#)	Constraints	Rationale
Id	Guid	**PK**	Customer identifier.
TenantId	string	**FK → Tenant**	Enforces mall scoping.
FullName	string	Required	Display name.
PhoneNumber	string	Required	**Primary lookup in Rwanda**; indexed per tenant.
Email	string?	Optional	Secondary contact; unique per tenant if set.
PreferredLanguage	string?	Optional	For future SMS/WhatsApp (e.g., en, rw, fr, sw).

1.4 Product

Field	Type (C#)	Constraints	Rationale
Id	Guid	**PK**	Product line identifier.
TenantId	string	**FK → Tenant**	Enforces mall scoping.
VendorId	Guid	**FK → Vendor**	Product belongs to one store.
Name	string	Required	Product name.
Description	string?	Optional	Details.
Price	decimal	Required	Current RWF price (money).
StockQuantity	int	Required	Physical on-hand stock.
ReservedQuantity	int	Required (default: 0)	Items on hold for reservations.
ImageUrl	string?	Optional	Image link.
Category	string?	Optional	Simple categorization.
Active	bool	Required (default: true)	Visibility toggle.

Field	Type (C#)	Constraints	Rationale
RowVersion	byte[]	Concurrency token	Prevents over-reservation on updates.
CreatedAt	DateTimeOffset	Required	Row creation timestamp.
Stock (alias)	int	—	Temporary alias mapping to StockQuantity for legacy code.

2) Reservation Workflow Entities

2.1 Reservation

Field	Type (C#)	Constraints	Rationale
Id	Guid	**PK**	Reservation identifier.
TenantId	string	**FK → Tenant**	Enforces mall scoping.
CustomerId	Guid	**FK → Customer**	Who reserved.
VendorId	Guid	**FK → Vendor**	Which store fulfills.
ReservationNumber	string	Required, **Unique per Tenant**	Human-readable ID, e.g., RES-2025-0001.
PickupCode	string	Required, **Unique per Tenant**	Short code (e.g., 6 digits) for fastest in-store lookup.
Status	ReservationStatus	Required	Pending/Confirmed/Completed/Rejected/Cancelled.
TotalAmount	decimal	Required	Σ of ReservationItem.LineTotal.
CustomerNotes	string?	Optional	Shopper notes.
VendorNotes	string?	Optional	Vendor notes (e.g., rejection reason).
CreatedAt	DateTimeOffset	Required	When placed.
ExpiresAt	DateTimeOffset	Required	Auto-cancel deadline (based on Tenant.DefaultExpiryHours).

Field	Type (C#)	Constraints	Rationale
ConfirmedAt	DateTimeOffset?	Optional	When vendor confirmed.
CompletedAt	DateTimeOffset?	Optional	When customer picked up & paid offline.
RejectedAt	DateTimeOffset?	Optional	When vendor rejected.
CancelledAt	DateTimeOffset?	Optional	When cancelled by customer/system.
StockFinalized	bool	Required (default: false)	Whether final stock deduction completed on Completed.

2.2 ReservationItem (Line Item)

Field	Type (C#)	Constraints	Rationale
Id	Guid	**PK**	Line identifier.
ReservationId	Guid	**FK → Reservation**	Parent reservation.
ProductId	Guid	**FK → Product**	Reserved product.
Quantity	int	Required (> 0)	Units reserved.
UnitPrice	decimal	Required	Price at reservation time (immutable).
LineTotal	decimal	Required	Quantity * UnitPrice.

3) Key Indices for Performance

Entity	Index Combination	Constraint	Purpose
Vendor	{ TenantId, LegalName }	—	Fast store search within a mall.
Customer	{ TenantId, PhoneNumber }	**Unique**	Primary customer lookup (Rwanda context).
Customer	{ TenantId, Email }	**Unique** (when set)	Secondary lookup.
Product	{ TenantId, VendorId, Active }	—	Core browsing query (by tenant + store, only active).

Entity	Index Combination	Constraint	Purpose
Reservation	{ TenantId, VendorId, Status, CreatedAt }	—	Vendor dashboard: list pending/confirmed efficiently.
Reservation	{ TenantId, PickupCode }	**Unique**	Fastest in-store pickup lookup.
Reservation	{ TenantId, ReservationNumber }	**Unique**	Human reference stability per tenant.

4) Relationships (Cardinality & Cascade)

- *Tenant 1- Vendors / Customers / Products / Reservations.*
Delete tenant ⇒ cascade delete child rows (PoC default).

- *Vendor 1- Products / Reservations.*
OnDelete: Restrict to avoid accidental mass deletes of products/reservations when a vendor is removed.

- *Customer 1- Reservations.*

- *Reservation 1- ReservationItems (Cascade).*

- *Product 1- ReservationItems (Restrict).*

5) Workflow & Invariants

- **Create (Pending):**
Validate StockQuantity - ReservedQuantity >= qty. Increment ReservedQuantity only (do **not** decrement StockQuantity yet).

- **Confirm:**
Set Status=Confirmed, stamp ConfirmedAt.

- **Complete (Pickup/Pay):**
Set Status=Completed, stamp CompletedAt, **decrement StockQuantity,** and reduce ReservedQuantity accordingly; set StockFinalized=true. Use RowVersion to prevent race conditions.

- **Reject/Cancel:**
Stamp RejectedAt/CancelledAt, **release** the held quantity from ReservedQuantity.

- **Expire:**
On scheduler/cleanup: auto-cancel Pending past ExpiresAt, releasing holds.

- **Enum:** ReservationStatus = Pending | Confirmed | Completed | Rejected | Cancelled.

6) Multi-Tenant Strategy

- Every business table has TenantId.

- Endpoints must **filter by TenantId** (header X-Tenant-Id or query tenantId).

- Optional global query filters can be re-enabled later (watch for model-cache pitfalls).