



PostFundManagement (PFM) Platform

Master Enterprise Manual: SRS v2.0 Blueprint (304 Requirements & 25 Modules), Physical PostgreSQL Database ERD (29 Tables & 104 FKs), Clean Architecture, Console/Partner Operations & Complete OpenAPI v1.0.0 Reference

The **PostFundManagement (PFM)** platform, engineered by Ifri Technologies, is an institutional-grade multi-tenant Software-as-a-Service (SaaS) solution built to orchestrate the complete post-funding grant, development finance, innovation (NSI/TRL), NGO/MEAL, and impact-investment lifecycle. Grounded in the IEEE 830-aligned **System Requirements Specification (SRS v2.0)** authored by S Phiri, the physical PostgreSQL schema (**ERD.erd**), and the production .NET 10.0 / React 19 codebase, this manual traces every requirement from original blueprint to relational database enforcement, REST API endpoints, and user interfaces.

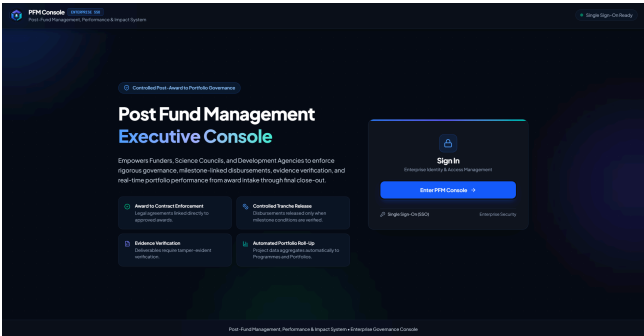


Figure 0.1: PostFundManagement (PFM) Executive Console landing interface (console.ifri.khongisa.co.za) enforcing the SRS v2.0 core pillars: Award-to-Contract Enforcement (**M01/M02**), Controlled Tranche Release (**M06**), Evidence Verification (**M07/M14**), and Automated Portfolio Roll-Up (**M20/M22**).

Canonical System Metadata, Blueprint & Production Baseline

Artefact / Layer	Version & Architectural Scope	Authoritative Source / URI
Original Blueprint (SRS)	IEEE 830 SRS v2.0 (13 Aug 2026, S Phiri) • 25 Modules (M01–M25), 304 FRs, 10 BRs, 10 NFRs, 14 ATs	PFM_SRS_v2_review.pdf (60 Pages)
Physical Database ERD	PostgreSQL 14+ (public / pfm) • 29 Tables & 104 Foreign Key Constraints	ERD.erd (DBeaver Physical Schema)
Platform & Domain Spec	PostFundManagement (PFM) Platform v2.0 • Hierarchical Domain Model & Enums	README.md (Gitea Repository)
Clean Architecture & RBAC	.NET 10.0 (C# 13) React 19 + TS 5.8 • 15 Claim Domains, 6 Roles & Maker-Checker	Architecture.md (v2.0 Spec)
Operational Lifecycle	5-Stage Post-Award to Tranche Disbursement State Machine	Processes.md (v2.0 Spec)
OpenAPI 3.1.1 Gateway	PostFundManagement.Api v1 (113 REST Operations / 7 Domains / 31 Models)	api.ifri.khongisa.co.za/openapi/v1/
Portals & Identity STS	ConsoleUI (console.ifri.khongisa.co.za) PartnerUI Duende STS (sts.security.khongisa.co.za)	favicon.svg & Production Portals

1. Executive Overview & The SRS v2.0 Founding Blueprint

The **PostFundManagement (PFM) Platform** was conceived to solve a systemic governance failure across public-sector funding agencies, science councils, development finance institutions (DFIs), NGOs, corporate CSI programmes, and impact investors: while pre-award application intake is heavily scrutinized, post-award execution often fragments across disconnected spreadsheets, email threads, and standalone accounting ledgers. Originally specified by Product Owner and Programme Sponsor **S Phiri** in the IEEE 830-aligned *System Requirements Specification: Post-Fund Management, Performance & Impact Management System (Version 2.0, 13 August 2026)* and realized in production by Ifri Technologies ([README.md](#)), the platform establishes a single, tamper-evident digital thread from the moment an award is approved through contracting, recipient onboarding, work breakdown execution, milestone-gated tranche disbursement, close-out, 60-month post-fund sustainability monitoring, and executive portfolio reporting.

1.1 Scope Boundary: Upstream Intake vs. Controlled Post-Fund Lifecycle

A foundational architectural principle defined in Section 2.1 and Section 2.2 of the SRS v2.0 blueprint is the strict **System Scope Boundary** (illustrated in Figure 1.1). Upstream pre-award activities—specifically Call for Applications, Application Submission, Eligibility Screening, Technical and Financial Assessment, Due Diligence, and Investment/Approval Committee deliberation—are explicitly *out of scope* of the internal post-award workflow and are treated as external upstream processes integrated via API (**M24**) or registered at the boundary. The controlled PFM system lifecycle begins the instant an authorized officer records an **Approved Funding Award (M01)** with a unique external approval reference number (**FR-M01-002**), which automatically initiates the **Contract/Agreement workflow (M02, BR-002)**.

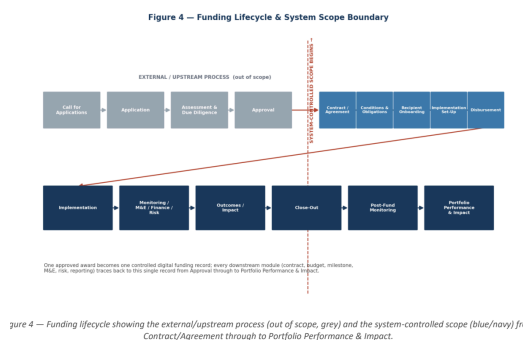


Figure 1.1: SRS v2.0 Figure 4 — Funding Lifecycle & System Scope Boundary separating external upstream pre-award processes (grey) from the system-controlled post-award lifecycle (blue/navy) spanning Contracting through Post-Fund Monitoring and Portfolio Impact.

1.2 Document Conventions: MoSCoW Prioritisation & Given/When/Then Traceability

In Revision 2.0 of the SRS (13 August 2026), all **304 functional requirements (FR-M01-001 through FR-M25-009)**, **10 master business rules (BR-001 through BR-010)**, and **10 non-functional requirements (NFR-001 through NFR-010)** were standardized into binding “the system shall” obligations paired with formal **Given / When / Then** acceptance criteria (where *Given* defines the precondition/state, *When* defines the triggering user or system event, and *Then* defines the observable validation and audit outcome) and prioritized using the **MoSCoW method**:

- **Must Have (159 Functional Requirements across 12 MVP Modules):** Mandatory for Release 1 go-live. The platform is not viable without these controls (e.g., award-to-contract enforcement, milestone-gated disbursement, Maker-Checker dual authorization, budget integrity, and immutable audit trails).
- **Should Have (96 Functional Requirements):** High-value operational capabilities scheduled for Release 2 immediately following MVP (e.g., automated compliance escalation **M10**, ESG sustainability tracking **M11**, TRL progression **M12**, change control **M15**, issue escalation **M16**, digital site visits **M17**, formal close-out **M18**, and 6–60 month post-fund monitoring **M19**).
- **Could Have (46 Functional Requirements):** Differentiating capabilities scheduled for Release 3 (e.g., licensing & follow-on investment tracking in **M12**, demographic beneficiary management in **M13**, and knowledge & learning case studies in **M21**).
- **Won't Have This Phase (3 Functional Requirements in M24):** Explicitly deferred to post-core phases (**FR-M24-004** ERP transaction import, **FR-M24-005** external research data integration, and **FR-M24-006** GIS spatial enrichment).

1.3 Stakeholder Analysis & Persona-to-Module Mapping (18 Stakeholder Groups)

Section 2.3 of the SRS v2.0 blueprint identifies **18 distinct stakeholder groups** (12 internal roles and 6 external or hybrid roles) whose operational requirements govern the platform's RBAC claims and dashboard topology:

Stakeholder Persona	Type	Primary Interest & Success Criteria	Mapped SRS Modules & Dashboards
Funding Administrator / Award Officer	Internal	Registers approved awards accurately and quickly with duplicate reference blocking.	M01 (Award Intake)
Programme Manager	Internal	Single view of contracts, milestones, budgets, and risks across their programme slice.	M02–M09, M15–M18, Dashboard D02
Finance Manager / Officer	Internal	Controlled tranche disbursement, commitment/expenditure tracking, audit-ready ledgers.	M05, M06, M25, Dashboard D03

Stakeholder Persona	Type	Primary Interest & Success Criteria	Mapped SRS Modules & Dashboards
M&E / MEAL Manager	Internal	Reliable indicator data from baseline to impact with minimal manual aggregation.	M08 , Dashboard D04
Risk & Compliance Officer	Internal	Visibility of ISO 31000 risk exposure and overdue statutory/contractual obligations.	M09, M10 , Dashboard D05
Legal / Contracts Officer	Internal	Enforceable, locked agreements with versioned amendments and signature verification.	M02 (Contract Management)
Innovation Manager	Internal	Tracks Technology Readiness Levels (TRL 1–9), IP assets, prototypes, and commercialisation.	M12 (NSI Innovation), Dashboard D06
ESG / Sustainability Manager	Internal	Consistent environmental, social, and governance indicator tracking across projects.	M11 (ESG & Sustainability)
Knowledge & Learning Manager	Internal	Captures lessons learned, failure causes, and case studies for future programme design.	M21 (Knowledge & Learning)
Portfolio / Executive Manager	Internal	Real-time, trustworthy portfolio KPIs and concentration analytics for board reporting.	M20, M22 , Executive Dashboard D01
System Administrator	Internal	Configures tenants, organisations, users, roles, claims, and instruments without DB access.	M23 (Administration & Configuration)
Integration Administrator	Internal	Reliable, monitored REST/JSON and webhook data exchange with STS, ERP, and banking.	M24 (Integration & API Mgmt)
Internal / External Auditor	Internal/Ext	Complete, tamper-evident transaction and JSON state-delta history for every decision.	M25 (Audit & Assurance)
Recipient / Grantee Administrator	External	Streamlined electronic onboarding, clear evidence upload guides, fast payment turnaround.	M03, M06, M07, M14 (PartnerUI)
Monitoring / Field Officer	Internal/Ext	Digital site-visit checklists and geotagged observation tools tolerating low connectivity.	M17 (Site / Field Monitoring)
Beneficiary (Indirect)	External	POPIA-protected personal data with accurate socio-economic outcome representation.	M13 (Beneficiary Management)
Donor / Funder / Investment Comm.	External	Assurance that approved capital is controlled, monitored, and delivering verified impact.	M20, M22 , Upstream Interface
Gov. Department / DFI (Tenant)	External	Strict tenant-level partition isolation with optional national/sector roll-up reporting.	Multi-Tenancy (Tenants), M22

1.4 The 10 Master Business Rules (BR-001 to BR-010) & Configurable Instruments

Section 9.3 and Section 9.5 of the SRS v2.0 blueprint establish **10 Master Business Rules** and **6 Configurable Funding Instrument Patterns** that govern every layer of the architecture, database schema, and API validation pipeline:

Rule ID	Master Rule Title	Binding Architectural Obligation	Priority	Production Enforcement Mechanism
BR-001	Approval is the lifecycle entry point	No contract may be created without an approved funding award.	Must Have	FK_Contracts_Awards_AwardId in PostgreSQL + M01 approval state check.
BR-002	Contract is the first controlled process	Once approval is captured, the system automatically initiates Contract/Agreement.	Must Have	Domain event on POST /v1/api/grants/awards auto-initiates Contract workflow.
BR-003	No uncontrolled disbursement	No payment may be released unless applicable contractual and financial conditions are satisfied.	Must Have	FK_Disbursements_Milestones_MilestoneId + Maker-Checker guard on M06 .
BR-004	Evidence-based performance	Reported performance must be supported by evidence where required.	Must Have	Evidences FKs to Milestones , Activities , and Indicators block unverified actuals.
BR-005	Single source of truth	A data element is captured once and reused throughout the lifecycle.	Must Have	Normalized 3NF schema in ERD.erd ; Organisations reused across awards via FKs.
BR-006	Configurable funding instruments	Different programmes may define different milestones, payment rules, KPIs, reporting periods, compliance conditions, and risk thresholds.	Should Have	Instruments (#12) and Rules (#23) tables bound to Programmes (#20) .
BR-007	Full auditability	Material decisions and changes must be auditable.	Must Have	Append-only AuditLogs (#2) + 45 FK_*_Users_* attribution constraints.

Rule ID	Master Rule Title	Binding Architectural Obligation	Priority	Production Enforcement Mechanism
BR-008	Results hierarchy	Input → Activity → Output → Outcome → Impact.	Must Have	Relational chain: Budgets → Activities → Indicators → Beneficiaries → Outcomes.
BR-009	Baseline / target / actual	All measurable indicators support Baseline → Target → Actual → Variance → Evidence.	Must Have	Indicators (#11) columns + FK_Evidences_Indicators_IndicatorId.
BR-010	Portfolio roll-up	Project information automatically rolls up to Programme → Portfolio → Institution → National/Donor reporting level.	Must Have	12 child tables → Projects → Programmes → Portfolios → Organisations / Tenants.

To satisfy **BR-006** and **NFR-009** without hard-coding a single grant model, the platform's **Instruments** and **Rules** entities support six configurable funding-instrument patterns (SRS Section 9.5):

1. **Standard Grant:** Award → Milestone → Disbursement → Reporting.
2. **Development Finance (DFI):** Investment → Drawdown → Conditions Precedent → Repayment / Performance.
3. **Impact Investment:** Investment → KPI Targets → Verified Impact → Financial / Impact Return.
4. **Blended Finance:** Combined Grant + Debt + Equity + Technical Assistance tranches under a unified programme structure.
5. **NGO / Development Programme:** Grant → WBS Activities → Demographic Beneficiaries → Outcomes → Social Impact.
6. **Innovation Funding (NSI):** Funding → Starting TRL → Prototype → Technology Validation → Commercialisation / Licensing.

2. Blueprint Data Flow Models, User Journeys & Production Clean Architecture

Section 3 and Section 4 of the SRS v2.0 blueprint define the data-flow and user-experience models that were translated into the production **Clean Architecture** and **Domain-Driven Design (DDD)** stack documented in [Architecture.md](#).

2.1 Context Diagram (DFD Level 0) & Core Lifecycle Data Flow (DFD Level 1)

Figure 2.1 presents the SRS **Context Diagram (DFD Level 0)** alongside the **Level 1 Data Flow Diagram (DFD Level 1)**:

- **DFD Level 0 (External Boundary Exchanges):** Positions the PFM System as the central orchestrator exchanging *Approved award decisions* with the external **Approval / Investment Committee**; *Synchronised master data* with **External Systems (ERP, GIS, Banking, Research DBs)**; *Onboarding data, evidence, reports, and payment requests* with the **Recipient Organisation**; *Payment instructions and reconciliations* with the **Finance / Treasury System**; *Audit trail queries* with **Auditor / Assurance**; and *Portfolio & impact reports* with the **Donor / Funder Executive**.
- **DFD Level 1 (Processes P1–P8 & Data Stores D1–D5):** Decomposes internal orchestration into eight module-aligned processes—**P1** Award Intake & Registration (**M01**), **P2** Contract & Onboarding (**M02–M03**), **P3** Project, Budget & Milestones (**M04**, **M05**, **M07**), **P4** Disbursement Control (**M06**), **P5** M&E, Risk & Compliance (**M08–M10**), **P6** Evidence & Document Mgmt (**M14**), **P7** Close-Out & Post-Fund (**M18–M19**), and **P8** Portfolio Reporting & BI (**M20**, **M22**)—persisting state across five logical data stores: **D1 Award/Contract Store**, **D2 Financial Ledger**, **D3 Evidence Repository** (Garage S3 + Evidences table), **D4 Indicator/Results Store**, and **D5 Portfolio Analytics Store**.

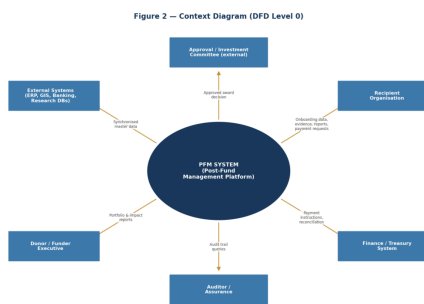


Figure 2 — Context Diagram (DFD Level 0): the System and its six external entities.

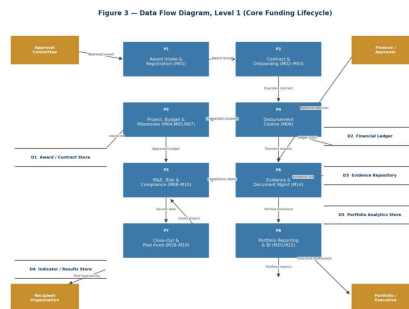


Figure 3 — Data Flow Diagram, Level 1: core funding lifecycle processes (P1–P8) and data stores (D1–D5).

Figure 2.1: SRS v2.0 Data Flow Architecture — Context Diagram DFD Level 0 (left) and Core Funding-Lifecycle DFD Level 1 showing Processes P1–P8 and Data Stores D1–D5 (right).

2.2 User Journey Maps & Wireframe-to-Production Realization

Section 4 of the SRS v2.0 blueprint maps three primary persona journeys—**Programme Manager: Award to Disbursement (SRS Figure 6)**, **Recipient Organisation: Onboarding to Payment (SRS Figure 7)**, and **Portfolio / Executive User: Quarterly Review (SRS Figure 8)**—and derives three low-fidelity UI wireframes (SRS Section 7, Figures 9–11) to resolve specific operational pain points:

1. **Resolving the "Milestone Due" Evidence Queue Bottleneck (SRS Figures 6 & 10 → Production Evidence Review Hub):** The Programme Manager journey identified a sharp sentiment drop at "Milestone Due" caused by evidence-review queue buildup, while the Recipient journey identified upload failures and unclear format rules. In production, this drove the design of the **Evidence Review & Verification Hub** (Figure 8.2) and S3 pre-signed link architecture (**M07/M14**).
2. **Resolving Single-Screen Executive Visibility & Commentary (SRS Figures 8 & 11 → Production Executive Dashboard & Inbox):** The Executive journey required scanning committed vs. disbursed capital, at-risk counts, sector distribution, and flagging projects for PM

explanation without manual spreadsheet reformatting. In production, this was realized as the **Executive Portfolio Dashboard** (Figure 7.1) paired with the in-app **Mailbox & Rich Text Communication Composer** (Figures 8.3 & 8.4).

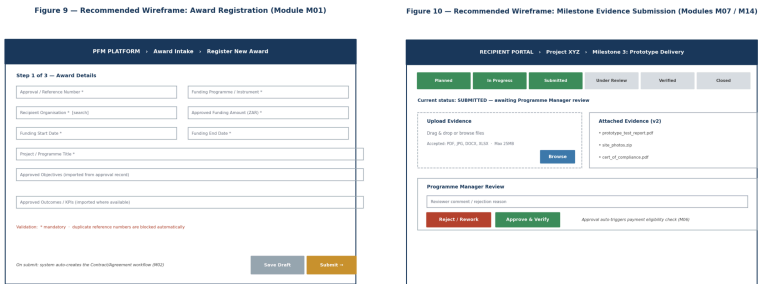


Figure 9 – Recommended wireframe: Award Registration form (M01).

Figure 10 – Recommended wireframe: Milestone status tracker and evidence submission/review (M07/M14).

Figure 2.2: SRS v2.0 Visual Proof Wireframes — Figure 9 Award Registration Form (**M01**, left) enforcing mandatory reference numbers and auto-initiation of **M02**, and Figure 10 Milestone Evidence Submission & Reviewer Sign-Off (**M07/M14**, right).

2.3 Production Clean Architecture & Three-Tier Zero-Staleness Stack

To satisfy the SRS 4-layer architecture (SRS **Figure 1**: Presentation Layer, Application Services covering 25 modules, Data Services, and Data Layer) and the performance targets in **NFR-001** (<3s page render) and **NFR-002** (<5s dashboard query), the production platform ([Architecture.md](#)) implements a strict **Clean Architecture / DDD** stack on **.NET 10.0 (C# 13)** and **React 19 + TypeScript 5.8 + Vite**:

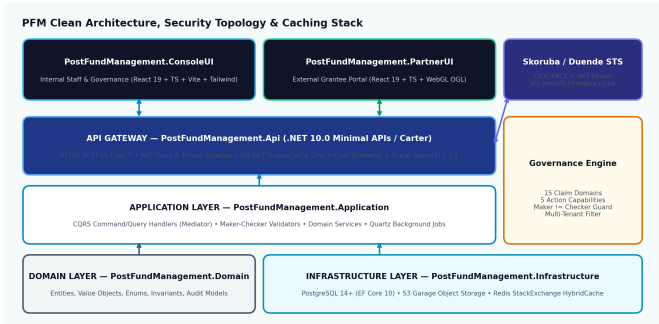


Figure 2.3: Production Four-Tier Clean Architecture topology integrating React 19 Presentation Portals, .NET 10.0 Minimal API Gateway, CQRS Application Layer, Domain Core, and PostgreSQL/S3/Redis Infrastructure ([Architecture.md](#)).

Solution Project	Architectural Tier	Primary Technologies & SRS Blueprint Alignment
PostFundManagement.Domain	Domain Layer	Pure C# 13 entities, value objects, enums (IndustrySector , ProjectType , EvidenceType , NotificationPlatform , NotificationStatus), and state invariants.
PostFundManagement.Application	Application Services	CQRS Command/Query handlers via Mediator , Maker-Checker & BR-001..010 validators, domain services, and Quartz scheduled escalation jobs (FR-M07-009 , FR-M09-006).
PostFundManagement.Infrastructure	Data & Infra Layer	PostgreSQL 14+ via Npgsql & EF Core 10 (29 tables), Skoruba / Duende STS , Garage S3 object store (D3), and Redis StackExchange hybrid cache.
PostFundManagement.Api	API Gateway Tier	ASP.NET Core (.NET 10.0) Minimal APIs / Carter (113 endpoints), JWT Bearer auth, 2-minute OutputCaching , OpenTelemetry (OTLP), and Scalar OpenAPI 3.1.1.
PostFundManagement.ConsoleUI	Presentation (Internal)	Internal Staff & Portfolio Governance portal (React 19 + TS 5.8 + Vite + Tailwind CSS + TanStack Query v5 + Axios with _v=timestamp cache busting).
PostFundManagement.PartnerUI	Presentation (External)	External Recipient & Grantee portal (React 19 + TS 5.8 + WebGL OGL + Vite) implementing M03 onboarding, M07/M14 evidence uploads, and M06 payment requests.
PostFundManagement.Tests	Verification Suite	Automated unit and integration test suites validating AT-01 through AT-14 , Maker-Checker guards, and RBAC claim matrices.

3. Physical Database Architecture & ERD Relational Enforcement (ERD.erd)

Whereas Section 3.3 of the SRS v2.0 blueprint introduced a 12-entity *Simplified Logical ERD* (SRS **Figure 5**) for initial stakeholder validation, the production database schema captured in **ERD.erd** (PostgreSQL data source **postgres-jdbc-19e7e2e5ab5-1629ea1cc0c40c3e**, database **pfm**, schema **public**) expands the model into a fully normalized, third-normal-form (3NF) physical relational schema comprising **29 tables** and **104 foreign key constraints**.

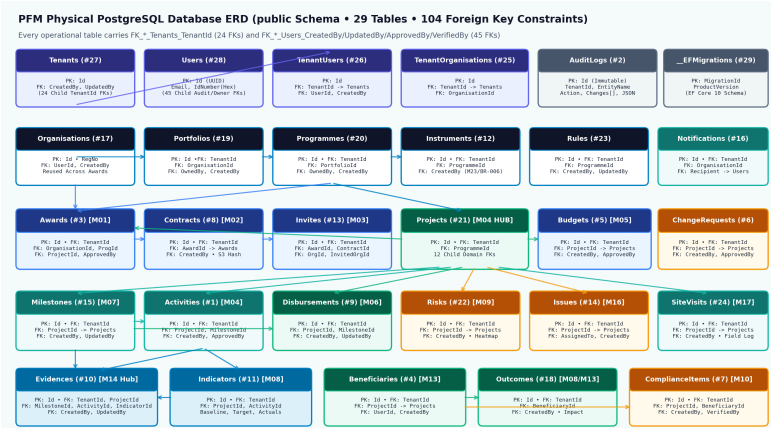


Figure 3.1: Complete Physical PostgreSQL Database ERD generated from **ERD.erd** (public schema, 29 tables, 104 foreign key relations), organized across five relational tiers from Identity & Multi-Tenancy down to M&E Evidence and Beneficiary Outcomes.

3.1 Evolution from SRS Simplified ERD to Production Physical Schema

Comparing the SRS Simplified ERD (SRS **Figure 5: Organisation, Award, FundingProgramme, Contract, Project, Budget/BudgetLine, Milestone, Disbursement, Indicator, Risk, Evidence, BeneficiaryGroup, PortfolioSnapshot**) against the physical **ERD.erd** schema reveals four major architectural enhancements engineered for enterprise production:

- Explicit Multi-Tenant Partitioning & Cross-Award Entity Reuse (Tenants, TenantUsers, TenantOrganisations):** Rather than hard-coding single-tenant ownership, **ERD.erd** introduces **Tenants (#27)** as the root partition table with ****24 direct FK *_Tenants_TenantId constraints****, while decoupling **Users (#28)** and **Organisations (#17)** via join tables **TenantUsers (#26)** and **TenantOrganisations (#25)**. This physically enables **FR-M03-013** ("recipient records reused across multiple awards") and multi-tenant isolation (**NFR-007, AT-14**).
- Decomposing Configurable Programme Governance (Portfolios, Programmes, Instruments, Rules):** Replaces the static **PortfolioSnapshot** box with live relational tables for **Portfolios (#19)**, **Programmes (#20)**, **Instruments (#12)**, and **Rules (#23)**, physically enforcing **BR-006** (configurable funding instruments) and real-time portfolio aggregation (**BR-010**).
- Expanding Project Execution & Assurance (Activities, ChangeRequests, ComplianceItems, Issues, SiteVisits, Outcomes, Invites, Notifications, AuditLogs):** Adds dedicated relational tables for WBS **Activities (#1) (M04)**, **Invites (#13) (M03)**, **ComplianceItems (#7) (M10)**, **ChangeRequests (#6) (M15)**, **Issues (#14) (M16)**, **SiteVisits (#24) (M17)**, **Outcomes (#18) (M08/M13)**, **Notifications (#16)**, and **AuditLogs (#2) (M25)**.
- Database-Level Maker-Checker & Ownership Attribution (45 Foreign Keys to Users):** Every domain table carries explicit foreign keys to **Users (#28)** separating record creation (**CreatedBy**) from verification/approval (**ApprovedBy**, **VerifiedBy**, **UpdatedBy**) and operational ownership (**OwnedBy**, **AssignedTo**, **Recipient**).

3.2 Three-Plane Relational Enforcement Architecture (104 Foreign Keys)

As illustrated in Figure 3.2, the **104 foreign key constraints** defined in **ERD.erd** do not merely link tables—they act as deterministic state-machine and security guards across three orthogonal planes:

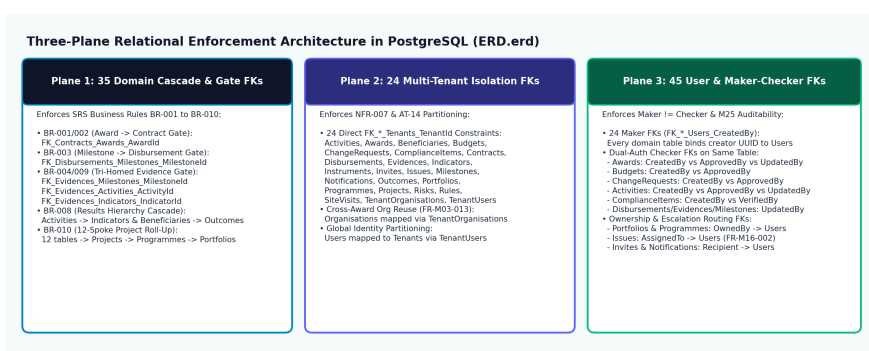


Figure 3.2: The Three-Plane Relational Enforcement Architecture in **ERD.erd** decomposing the 104 foreign key constraints into 35 Domain Cascade & Gate FKs, 24 Multi-Tenant Isolation FKs, and 45 User & Maker-Checker Attribution FKs.

- Plane 1 — 35 Domain Cascade & Lifecycle Gate Foreign Keys:**
 - Strategic Governance Cascade:** **Organisations (#17)** ← **Portfolios (#19)** ← **Programmes (#20)**, with **Programmes** parenting **Instruments (#12)**, **Rules (#23)**, **Projects (#21)**, and **Awards (#3)**. This guarantees that no project or award can exist outside a governed programme and funding instrument (enforcing **FR-M01-014** and **BR-006**).
 - Award-to-Contract & Onboarding Gate:** **Contracts (#8)** requires a valid **AwardId** via **FK_Contracts_Awards_AwardId** (physically enforcing **BR-001** and **AT-01**), while **Invites (#13)** binds simultaneously to **Awards (FK_Invites_Awards_AwardId)**, **Contracts (FK_Invites_Contracts_ContractId)**, and both host and invited **Organisations (FK_Invites_Organisations_OrganisationId, FK_Invites_Organisations_InvitedOrganisationId)**, enforcing **Module M03** onboarding prerequisites (**AT-03**).

- The 12-Spoke **Projects (#21)** Star Hub: Exactly **12 domain tables** carry direct foreign keys to **Projects (#21): Awards, Budgets, Milestones, Activities, Disbursements, Indicators, Evidences, Beneficiaries, ComplianceItems, ChangeRequests, Risks, Issues, and SiteVisits**. This star-schema hub around **Projects** enables single-query project roll-ups to **Programmes** and **Portfolios** within the 5-second SLA of **NFR-002** and **BR-010**.
- Milestone-Gated Disbursement & Tri-Homed Evidence Verification: **Disbursements (#9)** carries both **FK_Disbursements_Projects_ProjectId** and **FK_Disbursements_Milestones_MilestoneId**, ensuring that no payment tranche can be detached from a contractual milestone (enforcing **BR-003**, **FR-M06-002**, and **AT-05**). Meanwhile, **Evidences (#10)** implements a **quad-linked verification hub** carrying foreign keys to **Projects**, **Milestones** (**FK_Evidences_Milestones_MilestoneId**), **Activities** (**FK_Evidences_Activities_ActivityId**), and **Indicators** (**FK_Evidences_Indicators_IndicatorId**)—physically enforcing **BR-004** and **AT-06** across every reporting level.
- Beneficiary Outcomes & POPIA Compliance Sub-Graph: **Beneficiaries (#4)** parents both **Outcomes (#18)** (**FK_Outcomes_Beneficiaries_BeneficiaryId**, enforcing **FR-M13-005**) and **ComplianceItems (#7)** (**FK_ComplianceItems_Beneficiaries_BeneficiaryId**, enforcing POPIA safeguarding checks in **M10/M13**).
- **Plane 2 — 24 Multi-Tenant Partition Isolation Foreign Keys (FK_*_Tenants_TenantId):**
 - Every operational table (24 tables from **Activities** through **TenantUsers**) carries a non-nullable foreign key to **Tenants (#27)**. Entity Framework Core 10 global query filters bind the caller's JWT **tenant_id** claim directly to this indexed foreign key column on every **SELECT**, **UPDATE**, and **DELETE** statement, guaranteeing zero cross-tenant leakage (**NFR-007**, **AT-14**).
- **Plane 3 — 45 User Attribution & Maker-Checker Foreign Keys (FK_*_Users_*):**
 - *Dual-Key Maker-Checker Enforcement*: Tables subject to financial or operational approval carry distinct foreign keys to **Users (#28)** on the same row: **Awards** (**CreatedBy**, **ApprovedBy**, **UpdatedBy**), **Budgets** (**CreatedBy**, **ApprovedBy**), **ChangeRequests** (**CreatedBy**, **ApprovedBy**), **Activities** (**CreatedBy**, **ApprovedBy**, **UpdatedBy**), **ComplianceItems** (**CreatedBy**, **VerifiedBy**), and **Disbursements / Evidences / Milestones** (**CreatedBy**, **UpdatedBy**). Application validators and database constraints verify that the approving/verifying user UUID differs from **CreatedBy**, physically enforcing Segregation of Duties and satisfying **FR-M25-002** ("see who approved payments") and **FR-M25-003** ("see who changed budgets").

3.3 Complete Physical Table & Foreign Key Inventory (All 29 Tables in ERD.erd)

Table 3.1 catalogs all 29 tables in **ERD.erd** (**public** schema), their entity IDs, outbound foreign key count, parent tables, inbound child references, and mapped SRS modules:

ID & Table Name	Outbound FKs	Parent Target Tables (Foreign Key References)	Inbound Child FKs	SRS Module Scope
#1 Activities	6 FKs	Projects, Milestones, Tenants, Users (CreatedBy, UpdatedBy, ApprovedBy)	2 (Evidences, Indicators)	M04, M07
#2 AuditLogs	0 FKs (Immutable)	Standalone append-only ledger storing tenantId , entityId , performedBy , changes[] JSON	0 (Leaf Audit Store)	M25, NFR-008
#3 Awards	7 FKs	Organisations, Programmes, Projects, Tenants, Users (CreatedBy, UpdatedBy, ApprovedBy)	2 (Contracts, Invites)	M01 (Entry Point)
#4 Beneficiaries	4 FKs	Projects, Tenants, Users (UserId, CreatedBy)	2 (Outcomes, ComplianceItems)	M13, M08
#5 Budgets	4 FKs	Projects, Tenants, Users (CreatedBy, ApprovedBy)	0	M05 (Finance)
#6 ChangeRequests	4 FKs	Projects, Tenants, Users (CreatedBy, ApprovedBy)	0	M15 (Variations)
#7 ComplianceItems	5 FKs	Projects, Beneficiaries, Tenants, Users (CreatedBy, VerifiedBy)	0	M10, M18
#8 Contracts	3 FKs	Awards (AwardId), Tenants, Users (CreatedBy)	1 (Invites)	M02 (Contracts)
#9 Disbursements	5 FKs	Projects, Milestones (MilestoneId), Tenants, Users (CreatedBy, UpdatedBy)	0	M06 (Payouts)
#10 Evidences	7 FKs	Projects, Milestones, Activities, Indicators, Tenants, Users (CreatedBy, UpdatedBy)	0	M14, M07, M08
#11 Indicators	4 FKs	Projects, Activities, Tenants, Users (CreatedBy)	1 (Evidences)	M08, M11, M12, M19
#12 Instruments	3 FKs	Programmes, Tenants, Users (CreatedBy)	0	M23, BR-006

ID & Table Name	Outbound FKs	Parent Target Tables (Foreign Key References)	Inbound Child FKs	SRS Module Scope
#13 Invites	6 FKs	Awards, Contracts, Organisations (OrgId & InvitedOrgId), Tenants, Users (Recipient)	0	M03 (Onboarding)
#14 Issues	4 FKs	Projects, Tenants, Users (AssignedTo, CreatedBy)	0	M16 (Escalation)
#15 Milestones	4 FKs	Projects, Tenants, Users (CreatedBy, UpdatedBy)	3 (Activities, Disbursements, Evidences)	M07 (Deliverables)
#16 Notifications	3 FKs	Organisations, Tenants, Users (Recipient)	0	Comms / Alerts
#17 Organisations	2 FKs	Users (UserId, CreatedBy)	6 (Portfolios, Awards, Invites [x2], Notifications, TenantOrganisations)	M03, M23
#18 Outcomes	3 FKs	Beneficiaries (BeneficiaryId), Tenants, Users (CreatedBy)	0	M08, M13, M19
#19 Portfolios	4 FKs	Organisations, Tenants, Users (CreatedBy, OwnedBy)	1 (Programmes)	M20, M22
#20 Programmes	4 FKs	Portfolios, Tenants, Users (CreatedBy, OwnedBy)	4 (Projects, Awards, Instruments, Rules)	M04, M20, M23
#21 Projects	4 FKs	Programmes, Tenants, Users (CreatedBy, UpdatedBy)	12 Child Tables (Star Hub)	M04, M18, M19
#22 Risks	3 FKs	Projects, Tenants, Users (CreatedBy)	0	M09, M11
#23 Rules	4 FKs	Programmes, Tenants, Users (CreatedBy, UpdatedBy)	0	M23, BR-006
#24 SiteVisits	3 FKs	Projects, Tenants, Users (CreatedBy)	0	M17 (Field Audit)
#25 TenantOrganisations	3 FKs	Tenants, Organisations, Users (CreatedBy)	0	M23, NFR-007
#26 TenantUsers	3 FKs	Tenants, Users (UserId, CreatedBy)	0	M23, NFR-007
#27 Tenants	2 FKs	Users (CreatedBy, UpdatedBy)	24 Child Domain Tables	Multi-Tenancy Root
#28 Users	0 FKs	Root Identity Principal Table synchronized with Duende/Skoruba STS	45 Inbound Attribution FKs	IAM / RBAC / Audit
#29 __EFMigrationsHistory	0 FKs	EF Core 10 schema migration version tracking table	0	Infrastructure

4. Blueprint-to-Implementation Traceability: All 25 SRS Modules (M01–M25)

Section 5 and Section 9.1 of the SRS v2.0 blueprint decompose the platform into **25 functional modules (M01 through M25)** encompassing **304 testable functional requirements**. Table 4.1 provides the master traceability matrix linking every SRS module and its MoSCoW requirement count to the physical PostgreSQL tables in **ERD.erd**, the RBAC claim domains in [Architecture.md](#), and the production REST endpoints in [PostFundManagement.Api | v1](#):

Module & Name	MoSCoW (M/S/C/W = Total)	Blueprint Purpose, Workflow & Gate Rules	Enforcing ERD Tables & FKs	Production API & UI Mapping
M01 Award Intake & Funding Reg.	17 / 0 / 0 / 0 = 17 (MVP)	Creates controlled award record following upstream approval; blocks duplicate reference numbers (FR-M01-016); auto-initiates M02 (FR-M01-017) .	Awards (#3) → Organisations, Programmes, Projects, Users (ApprovedBy)	/v1/api/grants/awards (grant_financials)

Module & Name	MoSCoW (M/S/C/W = Total)	Blueprint Purpose, Workflow & Gate Rules	Enforcing ERD Tables & FKs	Production API & UI Mapping
M02 Contract & Agreement Mgmt	22 / 0 / 0 / 0 = 22 (MVP)	Workflow: DRAFT → UNDER REVIEW → EXECUTED → AMENDED → EXPIRED/TERMINATED . Locks executed version (FR-M02-020).	Contracts (#8) (FK_Contracts_Awards_AwardId), S3 PDF hash	/v1/api/grants/contracts & /execute (Figure 8.1)
M03 Recipient Onboarding	13 / 0 / 0 / 0 = 13 (MVP)	Verifies org profile, key personnel, POPIA-protected banking details, and compliance docs as a mandatory gate before 1st disbursement (FR-M03-012).	Organisations (#17), Invites (#13), TenantOrganisations (#25)	/v1/api/governance/organisations & /v1/api/communications/invites
M04 Project & Programme Mgmt	21 / 0 / 0 / 0 = 21 (MVP)	Workflow: SET-UP → READY → ACTIVE → AT RISK → SUSPENDED → COMPLETED → CLOSED → POST-FUND → ARCHIVED . WBS & Gantt.	Programmes (#20), Projects (#21), Activities (#1)	/v1/api/projects & /activities (Figures 7.2 & 7.3)
M05 Budget & Financial Mgmt	18 / 1 / 0 / 0 = 19 (MVP)	Tracks approved budgets, categories, revisions, commitments, expenditure, co-funding, and leveraged private investment (FR-M05-001..019).	Budgets (#5) (FK_Budgets_Projects_ProjectId, ApprovedBy)	/v1/api/grants/budgets (grant_financials)
M06 Disbursement Management	14 / 1 / 0 / 0 = 15 (MVP)	Links tranche schedules to milestones (FR-M06-002); validates conditions precedent; blocks duplicate approvals (FR-M06-008, AT-05).	Disbursements (#9) (FK_Disbursements_Milestones_MilestoneId)	/v1/api/execution/disbursements & /approve
M07 Milestone & Deliverable Mgmt	10 / 0 / 0 / 0 = 10 (MVP)	Workflow: PLANNED → IN PROGRESS → SUBMITTED → UNDER REVIEW → (REWORK VERIFIED) → PAID → CLOSED . Auto-escalates overdue (FR-M07-009).	Milestones (#15) ← Activities (#1), Disbursements (#9), Evidences (#10)	/v1/api/evidence/milestones (projects_milestones)
M08 M&E / MEAL Management	20 / 2 / 0 / 0 = 22 (MVP)	Supports Theory of Change, LogFrame, output vs. outcome vs. impact indicators, baselines, targets, actuals, and RAG variance (FR-M08-001..022).	Indicators (#11), Outcomes (#18), Evidences (#10)	/v1/api/evidence/indicators (evidence_risks)
M09 Risk Management	8 / 2 / 0 / 0 = 10 (MVP)	Tracks 12 risk categories (strategic, financial, operational, technical, commercial, governance, regulatory, reputational, cyber, fraud, ESG, sustainability).	Risks (#22) (FK_Risks_Projects_ProjectId)	/v1/api/execution/risks (Risk Register & Heatmap)
M10 Compliance Management	0 / 8 / 0 / 0 = 8 (Rel 2)	Tracks obligations across contract, financial, procurement, tax, statutory, reporting, audit, ESG, POPIA data protection, safeguarding, and IP.	ComplianceItems (#7) (ProjectId, BeneficiaryId, VerifiedBy)	/v1/api/projects/complianceitems

Module & Name	MoSCoW (M/S/C/W = Total)	Blueprint Purpose, Workflow & Gate Rules	Enforcing ERD Tables & FKs	Production API & UI Mapping
M11 ESG & Sustainability	0 / 8 / 0 / 0 = 8 (Rel 2)	Tracks environmental, social, and governance indicators, ESG project risks, sustainability plans, and post-funding sustainability scores (FR-M11-001..008).	Indicators (#11), Risks (#22), ComplianceItems (#7)	/v1/api/evidence/indicators & /execution/risks
M12 Innovation & Tech (NSI)	0 / 9 / 4 / 0 = 13 (Rel 2/3)	Creates Innovation Passports; tracks starting/current TRL, TRL progression, stalled/scale-ready tech, prototypes, IP/patents, licensing, follow-on capital.	Projects (#21) (ProjectType: Innovation), Indicators (#11), Evidences (#10)	/v1/api/projects & /evidence/indicators
M13 Beneficiary & Stakeholder	0 / 0 / 9 / 0 = 9 (Rel 3)	Registers beneficiaries, demographic groups, and geography; detects duplicates; protects POPIA PII while aggregating socio-economic outcomes (FR-M13-001..009).	Beneficiaries (#4), Outcomes (#18), ComplianceItems (#7)	/v1/api/projects/beneficiaries & /outcomes (beneficiaries)
M14 Evidence & Document Mgmt	9 / 0 / 0 / 0 = 9 (MVP)	Manages capture, versioning, categorization (13 evidence types), access control, retention rules, review sign-off, and rework return (FR-M14-001..009).	Evidences (#10) + Garage S3 buckets (15-min pre-signed URLs)	/v1/api/evidence/file & /securelink (Figure 8.2)
M15 Change Control & Variation	0 / 8 / 0 / 0 = 8 (Rel 2)	Governs variations across 9 change types (budget, duration, scope, KPI, milestone, beneficiary, personnel, geography, deliverable) while retaining original baseline.	ChangeRequests (#6) (CreatedBy, ApprovedBy)	/v1/api/projects/changerequests (change_management)
M16 Issue, Exception & Escalation	0 / 7 / 0 / 0 = 7 (Rel 2)	Logs operational issues, assigns owners (FR-M16-002), sets due dates, auto-escalates by severity, and links issues to risks and milestones.	Issues (#14) (FK_Issues_Users_AssignedTo, ProjectId)	/v1/api/projects/issues (change_management)
M17 Site / Field Monitoring	0 / 7 / 1 / 0 = 8 (Rel 2)	Schedules physical site visits, captures digital checklists, observations, and geotagged photos, links findings to KPIs, and tracks corrective actions.	SiteVisits (#24) (FK_SiteVisits_Projects_ProjectId)	/v1/api/projects/sitevisits (site_visits)
M18 Close-Out Management	0 / 9 / 0 / 0 = 9 (Rel 2)	Enforces 9 close-out gates (final technical/financial reports, asset reconciliation, final M&E, risks, compliance, audit, sustainability, lessons) & enrolls in M19 .	Projects (#21), ComplianceItems (#7), Budgets (#5)	/v1/api/projects & /complianceitems

Module & Name	MoSCoW (M/S/C/W = Total)	Blueprint Purpose, Workflow & Gate Rules	Enforcing ERD Tables & FKs	Production API & UI Mapping
M19 Post-Fund Monitoring	0 / 10 / 2 / 0 = 12 (Rel 2)	Tracks closed projects at 6, 12, 24, 36, and 60 months for org survival, revenue, jobs created, follow-on investment, tech adoption, and long-term impact.	Projects (#21), Indicators (#11), Outcomes (#18)	/v1/api/evidence/indicators & /projects
M20 Portfolio Management	15 / 0 / 0 / 0 = 15 (MVP)	Aggregates active awards and funding by sector, geography, org type, tech/TRL, programme, and status; flags high-risk, underperforming, and follow-on candidates.	Portfolios (#19) ← Programmes (#20) ← Projects (#21)	/v1/api/governance/portfolios/* & /dashboard
M21 Knowledge & Learning	0 / 0 / 8 / 0 = 8 (Rel 3)	Captures lessons learned, classifies successful practices and failure causes, links lessons to instruments, generates case studies, and tracks evaluation responses.	Programmes (#20), Instruments (#12), Evidences (#10)	/v1/api/governance/instruments & /evidence
M22 Reporting & BI	12 / 1 / 0 / 0 = 13 (MVP)	Generates project, programme, portfolio, financial, M&E, risk, compliance, ESG, innovation, impact, post-fund, and national/sector reports + Executive Dashboard.	All 29 tables rolled up via Portfolios, Programmes, Projects	/v1/api/governance/dashboard & .xlsx/.pdf Exports
M23 Admin & Configuration	0 / 3 / 8 / 0 = 11 (Rel 2/3)	Configures tenants, organisations, users, roles, permissions, programmes, instruments, workflow rules, indicator libraries, notification rules, and taxonomies.	Tenants (#27), Users (#28), TenantUsers (#26), Rules (#23), Instruments (#12)	/v1/api/governance/tenants/*, /users/*, /execution/rules
M24 Integration & API Mgmt	0 / 2 / 3 / 3 = 8 (Rel 2/3)	Imports external awards, syncs org/user/payment data, logs API failures, monitors integration health (ERP/Research/GIS deferred as Won't Have in Phase 1).	AuditLogs (#2), Users (#28), Awards (#3)	/v1/api/integration/sync & OpenAPI 3.1.1 Gateway
M25 Audit & Assurance	0 / 9 / 0 / 0 = 9 (Rel 2)	Maintains complete immutable transaction history; traces who approved payments, who changed budgets, contract versions, indicator-to-evidence, and audit exceptions.	AuditLogs (#2) + 45 FK_*_Users_* constraints	/v1/api/governance/auditlog (Figures 9.5 & 9.6)

4.1 Key Financial Formulas, M&E Thresholds & 3-Release Implementation Roadmap

To ensure mathematical consistency across financial ledgers (**M05**), M&E scorecards (**M08**), and executive dashboards (**M20/M22**), the SRS v2.0 blueprint mandates three core financial formulas (Section 5.5) and three configurable M&E RAG status thresholds (Section 9.6):

- **Budget Utilisation (%):** $(\text{Actual Expenditure} \div \text{Approved Budget}) \times 100$
- **Financial Variance (ZAR):** $\text{Approved Budget} - (\text{Actual} + \text{Committed Expenditure})$
- **Private-Sector Leverage Ratio:** $\text{Additional External Co-Funding} \div \text{Leveraged Capital} \div \text{Approved Funding Award}$
- **M&E Indicator RAG Status Thresholds (Default, Configurable per Instrument under FR-M08 / BR-006):**
 - **Green (On Track):** Realized Actual is $\geq 90\%$ of Target.

- **Amber (At Risk / Watch):** Realized Actual is **70% – 89%** of Target.
- **Red (Off Track / Critical):** Realized Actual is **< 70%** of Target (triggers automated dashboard flagging and escalation).

Section 9.2 of the SRS v2.0 blueprint sequences delivery along a single end-to-end MVP thread before layering secondary modules onto the same 29-table PostgreSQL backbone: **Award (M01) → Contract (M02) → Onboarding (M03) → Budget (M05) → Disbursement (M06) → Project (M04) → Milestone (M07) → Evidence (M14) → M&E (M08) → Risk (M09) → Portfolio & BI Dashboards (M20/M22).**

4.2 Non-Functional Requirements (NFR-001 to NFR-010) & High-Level Acceptance Test Plan (AT-01 to AT-14)

Tables 4.2 and 4.3 document the **10 Non-Functional Requirements** (SRS Section 6) and the **14 End-to-End Acceptance Test Scenarios** (SRS Section 8) alongside their concrete verification mechanisms in the built platform:

NFR ID	Category & Priority	Testable Requirement & SLA Target	Architectural Implementation in PFM v2.0
NFR-001	Performance — Pages (Must)	Render standard transactional pages (award, project, milestone) within 3 seconds at the 95th percentile under normal load.	React 19 + Vite bundle splitting, TanStack Query v5 local caching, and indexed PostgreSQL 14+ FK lookups.
NFR-002	Performance — Dashboards (Must)	Render standard dashboard queries within 5 seconds ; process heavy reports asynchronously with notification on completion.	ASP.NET Core OutputCaching (2-min policy) + Redis StackExchange tag eviction + Quartz background jobs.
NFR-003	Availability (Must)	Maintain at least 99.5% uptime over a calendar month (higher target for financial transaction components).	Containerized docker-compose.yml deployment with stateless .NET 10.0 API gateway instances and Redis backplane.
NFR-004	Security — Auth & Access (Must)	Enforce MFA/Passkeys, TLS encryption in transit and at rest, RBAC/ABAC access control, secure API tokens, and full audit logging.	Duende/Skoruba STS (sts.security.khongisa.co.za), OIDC PKCE (SHA-256), FIDO2 Passkeys, 15 RBAC claim domains, 15-min S3 links.
NFR-005	Scalability (Should)	Support thousands of organisations, tens of thousands of projects, and millions of indicator/evidence records without SLA degradation.	Offloaded binary storage in Garage S3 / AWS S3 + paginated API endpoints (/files/{page}/{pageSize}).
NFR-006	Disaster Recovery (Should)	Support a Recovery Point Objective (RPO) ≤ 1 hour and a Recovery Time Objective (RTO) ≤ 4 hours for production.	PostgreSQL WAL continuous archiving and S3 bucket replication with automated EF Core 10 migration history (#29).
NFR-007	Multi-Tenancy Isolation (Must)	Logically isolate each tenant's users, programmes, instruments, awards, projects, indicators, and reports.	24 FK_*_Tenants_TenantId constraints + EF Core 10 global query filters + JWT tenant_id claim binding.
NFR-008	Auditability (Must)	Maintain a complete, immutable, user-attributed audit trail of all material transactions queryable indefinitely.	Append-only AuditLogs (#2) table capturing JSON state deltas + 45 FK_*_Users_* constraints.
NFR-009	Configurability (Should)	Allow administrators to configure funding-instrument rules, milestones, KPIs, and thresholds without vendor code changes.	Instruments (#12) and Rules (#23) tables managed via /v1/api/governance/instruments and /execution/rules .
NFR-010	Usability — Mobile/Field (Should)	Provide a mobile-optimised experience for field site-visit data capture that tolerates intermittent connectivity and syncs on reconnect.	Responsive Tailwind CSS / React 19 UI with TanStack Query mutation persistence and /v1/api/projects/sitevisits .

Test ID & Scenario	Given (Precondition)	When (Triggering Action)	Then (Verified System & Database Outcome)
AT-01 Award to Contract	Authorised officer has valid approval ref & amount > 0 (or award lacks signed contract).	Submits new award registration (or attempts disbursement without contract).	Creates Awards row, rejects duplicate ref, auto-initiates Contracts workflow; blocks disbursement if no executed contract exists.
AT-02 Contract Execution	Contract has required parties, effective date, and signatures (or is missing signature).	Authorised signatory executes agreement via /v1/api/grants/contracts/execute .	Locks contract as Active (Locked) authoritative version and enables downstream budget/milestones; blocks if signature missing.
AT-03 Onboarding Gate	Recipient has outstanding onboarding items (e.g., banking details unverified in M03).	Finance Officer attempts to process the first disbursement tranche.	System blocks payment release until recipient onboarding checklist is marked complete (FR-M03-012).

Test ID & Scenario	Given (Precondition)	When (Triggering Action)	Then (Verified System & Database Outcome)
AT-04 Budget Control	Approved Budgets line has a fixed monetary ceiling.	Cumulative commitments + expenditure would exceed approved budget line.	Flags budget overrun and requires an approved budget revision/variation (M05/M15) before recording commitment.
AT-05 Milestone Disbursement	Milestone is verified with approved Evidences (or payment already approved once).	Finance reviews linked payment request (or attempts 2nd approval on same request).	Displays payment as eligible only when milestone is verified; Maker-Checker guard blocks duplicate/self approval (M06).
AT-06 Evidence & Indicators	Indicator has baseline/target and requires mandatory supporting evidence.	Recipient submits actual value without evidence (or with valid evidence).	Blocks un-evidenced actuals; when valid, auto-calculates variance and Green ($\geq 90\%$), Amber (70–89%), or Red ($< 70\%$) status.
AT-07 Risk Escalation	Risk in Risks (#22) is rated High with an assigned owner and mitigation due date.	Mitigation due date passes without resolution.	Quartz job auto-escalates the risk and surfaces alerts on the Risk Dashboard (D05) and PM Dashboard (D02).
AT-08 Compliance Tracking	Contractual reporting obligation in ComplianceItems (#7) has a due date.	Due date passes without a compliant verified submission.	Marks obligation overdue and triggers automated escalation per configured compliance workflow (M10).
AT-09 Change Control	Recipient requests budget reallocation exceeding configured threshold in ChangeRequests (#6) .	Programme Manager assesses impact and independent Checker approves.	Updates approved baseline only after Maker-Checker approval is recorded, retaining original baseline for audit (M15).
AT-10 Close-Out & Post-Fund	Project has outstanding obligations (or closure is confirmed for post-fund project).	PM attempts to close project (or confirms final closure).	Blocks closure and lists outstanding items; once confirmed, auto-enrols project in M19 Post-Fund schedule (6/12/24/36/60 mos).
AT-11 Portfolio Roll-Up	Indicator actuals are captured and verified at project level (Projects #21).	Portfolio Manager opens the Executive Portfolio Dashboard (D01).	Aggregates figures across Programmes and Portfolios within 5s SLA (NFR-002) with drill-down traceability.
AT-12 Audit Trail Integrity	Any material transaction occurs (approval, payment, budget/status change, user sync).	Transaction is committed to PostgreSQL.	Writes an immutable, timestamped, user-attributed JSON record to AuditLogs (#2) that cannot be edited or deleted even by Admins.
AT-13 Role-Based Access	User holds a role without payment-approval permission (e.g., Contributor).	Attempts to approve a payment via UI or /v1/api/execution/disbursements/*/approve .	API gateway denies the action (HTTP 403) and logs the unauthorized attempt in AuditLogs .
AT-14 Multi-Tenancy Isolation	Two or more tenants (e.g., Tenant #1 Ifri Technologies and Tenant #2 Demo Tenant) exist.	User from Tenant A queries awards, projects, or contracts.	EF Core global filter on FK_*_Tenants_TenantId returns strictly Tenant A's records unless caller holds cross-tenant root role.

5. Security Topology, RBAC Claim Matrix & Maker-Checker Governance

To enforce **NFR-004**, **NFR-007**, **AT-13**, and **AT-14**, authentication and authorization are cleanly decoupled across system boundaries ([Architecture.md](#)). Authentication is handled by **Duende IdentityServer / Skoruba STS** at <https://sts.security.khongisa.co.za> (**Lite Charms Security**, Figure 5.1) using **OIDC Authorization Code Flow with PKCE (SHA-256)**, FIDO2/WebAuthn Passkeys, and federated Google login. External recipients holding the **partner** role are confined exclusively to **PostFundManagement.PartnerUI** (Figure 5.2) and automatically locked out of **ConsoleUI**.

Neither React 19 portal ever touches raw user credentials; instead, web clients request six OIDC scopes (**openid**, **profile**, **roles**, **email**, **address**, and **pfm-api-dev**) from **/connect/authorize** and receive cryptographically signed JWT Bearer tokens containing the caller's role-derived security claims and direct **tenant_id** partition binding. Every API request to **PostFundManagement.Api** validates the token signature and injects the caller's **tenant_id** into EF Core 10 global query filters across all 24 **FK_*_Tenants_TenantId** constraints.

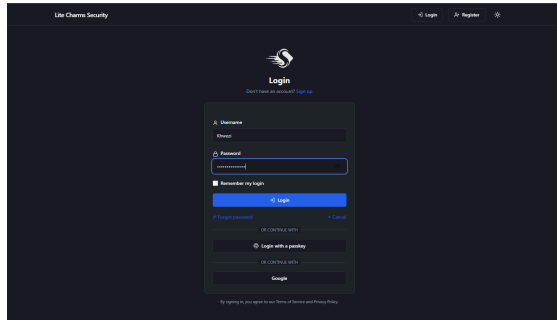


Figure 5.1: The centralized Security Token Service (STS) login portal (*Lite Charms Security* at <https://sts.security.khongisa.co.za>) enforcing **NFR-004** via Username/Password, FIDO2/WebAuthn Passkeys, and federated Google SSO.

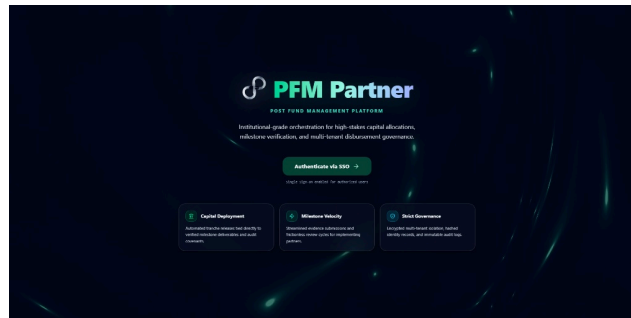


Figure 5.2: The dedicated external recipient portal (**PostFundManagement.PartnerUI**) featuring WebGL (OGL) rendering and single sign-on authentication for implementing partners ([README.md](#)).

5.1 Reconciliation of SRS Action Legend (C/R/U/A/V/X) with Production RBAC Claims

Section 9.4 of the SRS v2.0 blueprint defines a six-code Role-Permission Legend: **C (Create)**, **R (Read)**, **U (Update)**, **A (Approve)**, **V (Verify)**, and **X (Export)**. In the production architecture ([Architecture.md](#)), these six conceptual actions are consolidated into a progressive **5-tier capability hierarchy** across **15 operational claim domains** (`dashboard`, `governance`, `projects_milestones`, `grant_financials`, `evidence_risks`, `beneficiaries`, `change_management`, `site_visits`, `settings_invites`, `settings_users`, `settings_auditlog`, `settings_notifications`, `tenant_self_service`, `tenant_management`, and `unrestricted`):

- **view (maps to SRS R – Read)**: Read-only inspection of entity directories, details, KPI scorecards, and timelines.
- **add (maps to SRS C – Create and non-approval U – Update)**: Encompasses **view**; authorizes creating draft records, editing drafts, logging activities, uploading evidence, and submitting records for review.
- **update (maps to SRS A – Approve and V – Verify)**: Encompasses **view** and **add**; grants authoritative governance approval and verification power (**Approved**, **Active** contracts, **Verified** evidence), subject always to the Maker-Checker invariant: **CanApprove = HasPermission('update') ^ (CurrentUserId ≠ Record.CreatedByUserId)**.
- **export (maps to SRS X – Export)**: Encompasses **view**; authorizes extracting **.xlsx** spreadsheets and **.pdf** reports.
- **all (Full Domain Authority)**: Combines **view**, **add**, **update**, and **export** across the claim domain.

Platform Role	Assigned Claim Domains	Capabilities	Approval / Verification (update)
Admin	<code>unrestricted</code> (all 15 system & tenant domains)	all	Yes (System-Wide, Maker ≠ Checker)
Executive	<code>dashboard</code> , <code>governance</code> , <code>projects_milestones</code> , <code>grant_financials</code> , <code>evidence_risks</code> , <code>tenant_self_service</code>	all	Yes (Strategic & Portfolio, Maker ≠ Checker)
Manager	<code>dashboard</code> , <code>projects_milestones</code> , <code>grant_financials</code> , <code>evidence_risks</code> , <code>beneficiaries</code> , <code>change_management</code> , <code>site_visits</code> , <code>settings_invites</code> , <code>settings_users</code> , <code>settings_auditlog</code> , <code>settings_notifications</code> , <code>tenant_self_service</code>	all	Yes (Operational Domains, Maker ≠ Checker)
Supervisor	<code>dashboard</code> (view , export), plus <code>projects_milestones</code> , <code>grant_financials</code> , <code>evidence_risks</code> , <code>beneficiaries</code> , <code>change_management</code> , <code>site_visits</code> , <code>settings_invites</code> , <code>settings_users</code>	view , add , update , export	Yes (Verification & Check, Maker ≠ Checker)
Contributor	<code>projects_milestones</code> , <code>grant_financials</code> , <code>evidence_risks</code> , <code>beneficiaries</code> , <code>change_management</code> , <code>site_visits</code> , <code>settings_invites</code>	view , add	No — Strictly Prohibited (Enforces AT-13)
Partner	External Grantee Scope (PartnerUI only; locked out of ConsoleUI)	Scoped recipient actions	No — External Recipient

6. ConsoleUI Operations: Executive Dashboard & Project WBS Execution

The production **PostFundManagement.ConsoleUI** interface directly realizes the SRS wireframes and operational modules (**M04**, **M05**, **M07**, **M20**, **M22**). As shown in Figure 6.1, the **Executive Portfolio Dashboard (Dashboard D01)** (powered by **GET /v1/api/governance/dashboard**) displays real-time roll-up telemetry across the active tenant partition (**Ifri Technologies [jdPB2zakM3Z]**) with global filters for **PROGRAMME**, **SECTOR**, and **PERIOD (FY 2026/27)**.

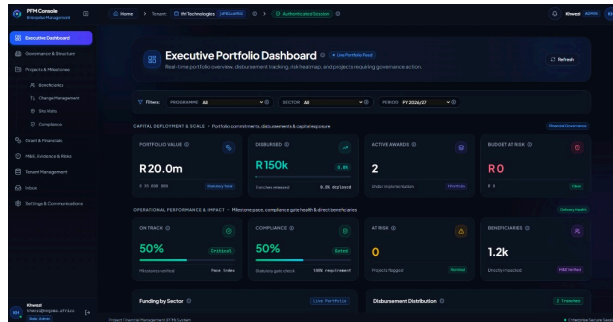


Figure 6.1: Production realization of SRS Wireframe D01 — The Executive Portfolio Dashboard in **PostFundManagement.ConsoleUI** displaying Capital Deployment & Scale KPIs (**R 20.0m** Portfolio Value, **R 150k / 0.8%** Disbursed, **2** Active Awards, **R 0** Budget at Risk) and Operational Performance & Impact gauges (**50%** On Track, **50%** Compliance, **0** At Risk, **1.2k** M&E-Verified Beneficiaries).

6.1 Project & Milestone Management (**M04** & **M07**) and 300-Day Gantt Timeline

Navigating to **Projects & Milestones** opens the **Interactive WBS Console** (Figure 6.2), which manages the **Projects (#21)**, **Milestones (#15)**, **Activities (#1)**, and **Indicators (#11)** tables across three tabs: **Projects Directory (2)**, **Performance Indicators (1)**, and **Realized Actuals & Variance (1)**. Clicking **View Project** on **Project #4: Thermal Survey** (under parent programme **Community Modernization — Programme #2**) opens the **Project View Modal & 300-Day Implementation Schedule Gantt** (Figure 6.3), providing swimlanes for **Contractual Deliverables & Milestones** and **Work Breakdown Activities** alongside a direct jump to the project's **Evidence Queue**.

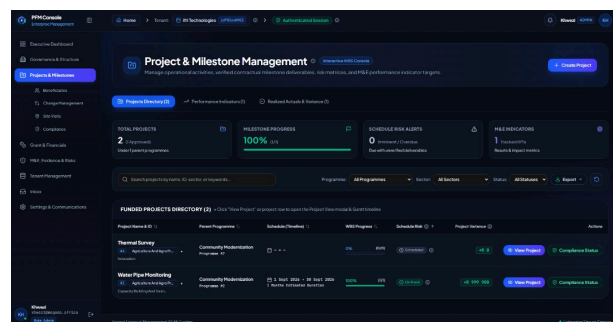


Figure 6.2: The Project & Milestone Management workspace (**M04/M07**) showing summary WBS metrics and the Funded Projects Directory (*Thermal Survey #4* and *Water Pipe Monitoring #1*).

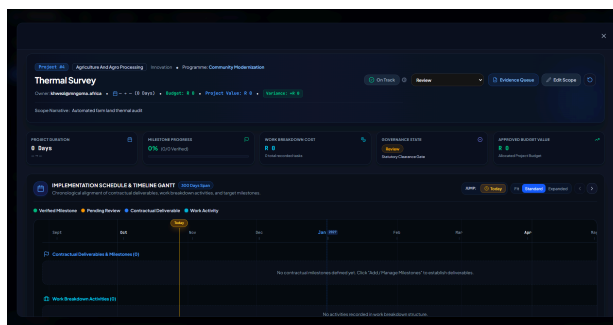


Figure 6.3: The Project View Modal for *Thermal Survey (Project #4)* featuring governance state controls (**Review — Statutory Clearance Gate**), five project KPI scorecards, and the 300-Day Implementation Schedule & Timeline Gantt.

7. Contracting (**M02**), Evidence Verification Hub (**M14**) & Communications

Within the **M&E, Evidence & Risk Management** workspace, the platform enforces the contract execution locks (**M02**, **AT-02**) and evidence verification gates (**M07**, **M14**, **AT-05**, **AT-06**) defined in the SRS blueprint:

- **Contract Registry & 15-Minute S3 Pre-Signed Links (Contracts & PDF Documents, Figure 7.1):** Displays every record in **Contracts (#8)** with its cryptographic reference hash (e.g., **Contract #4 | Hash: VW1YKjzKnJ7 | R 10 000 | Active (Locked)** for **Amazing Tech**, and **Contract #1 | Hash: jdPB2zakM3Z | R 10 000 000 | Pending Approval** for **ABC Funders**) and generates 15-minute ephemeral download links via **GET /v1/api/evidence/{evidenceId}/securelink**.
- **Deliverable Evidence Review & Verification Hub (Evidence Review & Verification, Figure 7.2):** Realizes SRS Wireframe Figure 10 in production. Officers ingest S3 artifacts via **+ Ingest Evidence (PUT /v1/api/evidence/file, M14)**, filter the **Verification Queue** by status (**All Evidence, Awaiting Review, Approved & Verified, Rejected**) and across five dimensions (**Project: Thermal Survey, Milestone, Activity, Awardee / Submitter, and Search Document**), and execute Maker-Checker verification sign-offs.

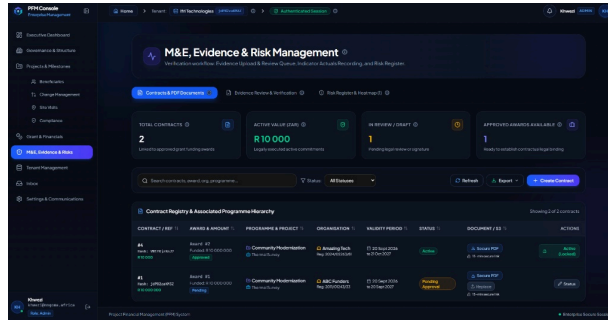


Figure 7.1: The Contract Registry (**M02**) showing cryptographic contract hashes, S3 15-minute secure PDF links, and the Maker-Checker **Active (Locked)** execution state.

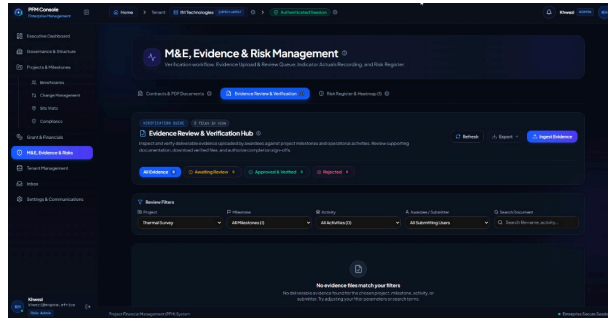


Figure 7.2: Production realization of SRS Wireframe Figure 10 — The Evidence Review & Verification Hub (**M07/M14**) featuring the Verification Queue, + **Ingest Evidence** uploader, status filter pills, and five-dimensional review filters.

7.1 In-App Mailbox & Rich Text Communication Composer

To support the in-app escalation and PM commentary workflows identified in the SRS Executive User Journey (**SRS Section 4.3 & M16**), the **Mailbox & Communications (Inbox)** workspace provides a three-pane message reader and quick-reply center (Figure 7.3) backed by the **Notifications (#16)** table, alongside the full-featured **Compose New Communication (Rich Text Composer)** modal (Figure 7.4) supporting selectable **In-App** or branded **Email** dispatch, tenant-scoped recipient lookup, live delivery preview, and institutional formatting macros (**PFM Notice** and **Embed Logo**).

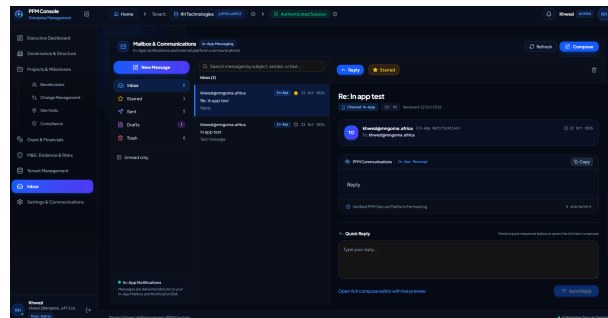


Figure 7.3: The three-pane Mailbox & Communications interface featuring folder management, full-text search, verified platform formatting, and quick reply.

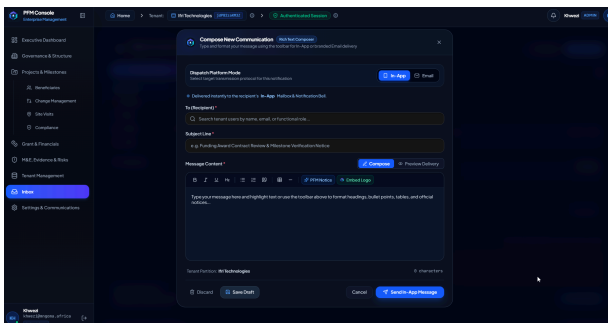


Figure 7.4: The Compose New Communication (Rich Text Composer) modal supporting selectable In-App or Email transmission protocols, institutional macros (**PFM Notice** and **Embed Logo**), and live delivery preview.

8. Multi-Tenant Administration (**M23**), Direct User Governance & Audit Forensics (**M25**)

Realizing **Module M23 (Administration & Configuration)**, **Module M25 (Audit & Assurance)**, **NFR-007**, and **NFR-008**, **ConsoleUI** exposes complete administrative control over the **Tenants (#27)**, **TenantOrganisations (#25)**, **TenantUsers (#26)**, **Users (#28)**, and **AuditLogs (#2)** tables without database intervention:

- **Tenant Management Directory & Scoped Legal Organisations (Figure 8.1):** Displays all 3 configured partitions (**Ifri Technologies #1** and **Demo Tenant #2**) and expands Tenant #1's **Scoped Organisations** drawer (**GET /v1/api/governance/tenants/{tenantId}/organisations**)

to list the three mapped legal entities in **TenantOrganisations (#25)**: **ABC Funders (#1, Reg: 2011/01243/33)**, **Amazing Tech (#3, Reg: 2024/02263/81)**, and **DEF Construction (#4, Reg: 2026/254254/124)**.

- **Tenant Users & POPIA-Compliant Hex ID Masking (Figure 8.2)**: The second drawer tab, **Tenant Users & Administration (GET /v1/api/governance/tenants/{tenantId}/users)**, lists the 5 provisioned users in **TenantUsers (#26)**, masking national ID numbers in hexadecimal form (**790327•••••89, 931002•••••89**) with explicit reveal/copy controls in compliance with SRS Section 2.5 POPIA data protection rules.

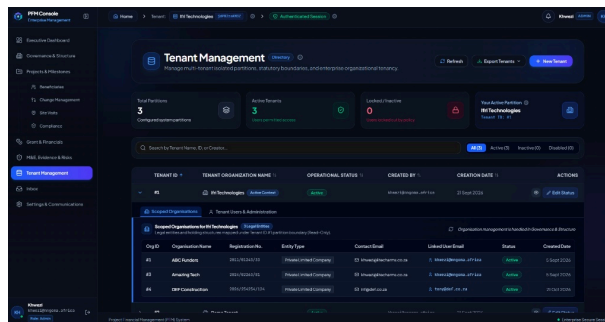


Figure 8.1: The Tenant Management Directory (M23) showing Tenant ID #1 (*Ifri Technologies*) expanded to display the *Scoped Organisations* sub-tab backed by **TenantOrganisations (#25)**.

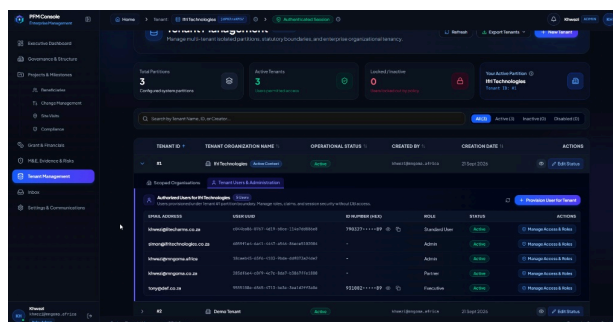


Figure 8.2: The *Tenant Users & Administration* sub-tab backed by **TenantUsers (#26)** and **Users (#28)**, illustrating POPIA-compliant hex ID masking and direct user provisioning.

8.1 Direct Four-Tab User Administration & Forensic Audit Event Inspection

Clicking **Manage Access & Roles** opens the four-tab **User Administration** modal (Figures 8.3 and 8.4 for **simon@ifritechnologies.co.za**), allowing administrators to suspend accounts (Tab 1), enforce the **1-role-per-user invariant** (Tab 2: **Active Assigned Role 1 of 1 Max**), inspect **Read-Only Role-Derived Claims** vs. **Direct User Claims** (tenant and **tenant_id**, Tab 3), and execute emergency **Force Logout** JWT revocation or **100-year Account Lockout** controls (Tab 4). Every such action is recorded in the append-only **AuditLogs (#2)** table and surfaced in the **System Administration & Audit** ledger (Figure 8.5) and the **Audit Event Inspector Modals** (Figure 8.6, showing **Event #209 SyncUser** and **Event #206 SetUserLockout** with parsed state deltas and copyable raw JSON records).

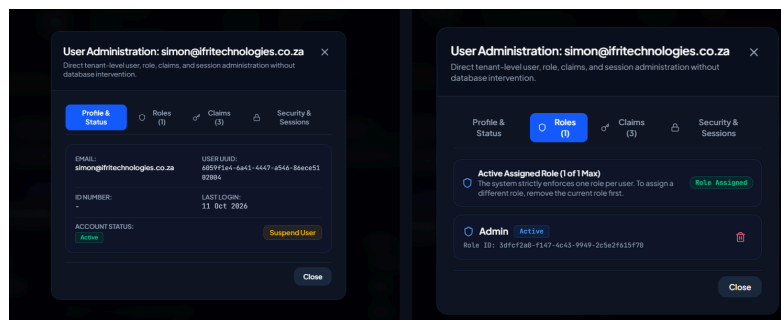


Figure 8.3: The *User Administration* modal showing Tab 1 (*Profile & Status* with account suspension control, left) and Tab 2 (*Roles* (1) enforcing the strict 1-role-per-user invariant, right).

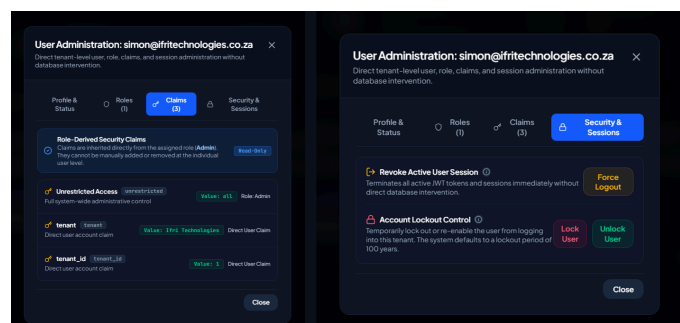


Figure 8.4: The *User Administration* modal showing Tab 3 (*Claims* (3) distinguishing Role-Derived Security Claims from Direct User Claims, left) and Tab 4 (*Security & Sessions* providing immediate JWT revocation and 100-year lockout controls, right).

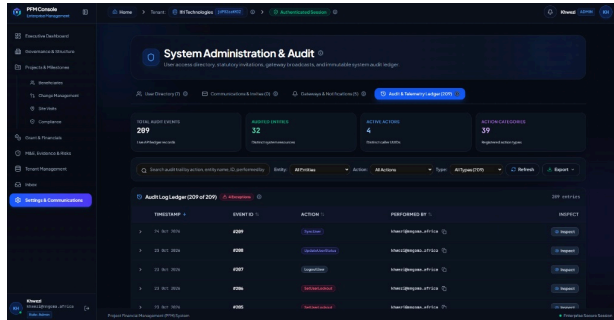


Figure 8.5: The System Administration & Audit workspace (**M25**) displaying the Audit & Telemetry Ledger (**AuditLogs #2**) with 209 immutable API event records and 4 flagged exceptions.

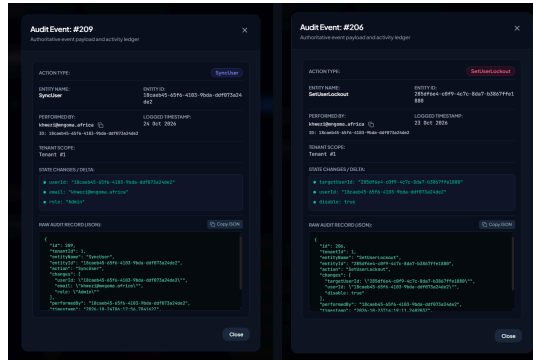


Figure 8.6: Forensic Audit Event Inspector modals (**M25** / **AT-12**) for Audit Event #209 (SyncUser) (left) and Audit Event #206 (SetUserLockout) (right), displaying caller UUID attribution, tenant scope, state change deltas, and copyable Raw Audit Record JSON payloads.

9. Complete OpenAPI 3.1.1 Specification (PostFundManagement.Api | v1)

All communication between **ConsoleUI**, **PartnerUI**, external integrations (**M24**), and backend domain services passes through **PostFundManagement.Api | v1** (Version **v1.0.0**, OpenAPI **3.1.1**), documented interactively via **Scalar** at <https://api.ifri.khongisa.co.za/openapi/v1/> (Figure 9.1). Direct unauthenticated requests to <https://api.ifri.khongisa.co.za/openapi/v1.json> outside the Scalar web wrapper are restricted, while authorized engineers can test all **113 REST operations across 7 functional domain tag groups** using OAuth2 PKCE (**Client ID: pfm-api-scalar-dev**, **SHA-256**, scopes: **openid**, **profile**, **roles**, **email**, **address**, **pfm-api-dev**).

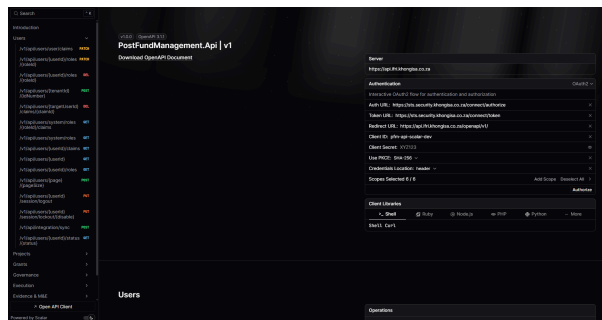


Figure 9.1: The interactive Scalar OpenAPI 3.1.1 portal for **PostFundManagement.Api | v1** (api.ifri.khongisa.co.za/openapi/v1/) showing OAuth2 PKCE configuration, domain endpoint groups, and multi-language client SDK generators.

9.1 Tag Group 1: Users & Identity Integration Endpoints (15 Operations — SRS M23/M24)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
PATCH	/v1/api/users/user/claims	Adds a security or domain claim to a user principal (AddUserClaimRequest , M23).
PATCH	/v1/api/users/{userId}/roles/{roleId}	Assigns or updates a system role for userId (FR-M23-003).
DELETE	/v1/api/users/{userId}/roles/{roleId}	Removes an assigned role from userId (enforcing the 1-role-per-user replacement rule).
POST	/v1/api/users/{tenantId}/{idNumber}	Registers/provisions a user in Users (#28) & TenantUsers (#26) using hex-masked ID number (FR-M23-002).
DELETE	/v1/api/users/{targetUserId}/claims/{claimId}	Removes a specific claim (claimId) from targetUserId (FR-M23-004).
GET	/v1/api/users/system/roles/{roleId}/claims	Retrieves authoritative role-derived claims associated with a system roleId .
GET	/v1/api/users/system/roles	Retrieves all available system roles defined in the platform.
GET	/v1/api/users/{userId}/claims	Retrieves all effective claims (role-derived and direct tenant claims) for userId .

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
GET	/v1/api/users/{userId}	Retrieves detailed user profile metadata from Users (#28) by userId .
GET	/v1/api/users/{userId}/roles	Retrieves the active role assigned to userId .
POST	/v1/api/users/{page}/{pageSize}	Retrieves a paginated list of users across the active tenant directory.
PUT	/v1/api/users/{userId}/session/logout	Terminates active JWT sessions for userId ; logs LogoutUser in AuditLogs (#2) .
PUT	/v1/api/users/{userId}/session/lockout/{disable}	Manages 100-year account lockout status for userId ; logs SetUserLockout in AuditLogs (#2) .
POST	/v1/api/integration/sync	Synchronizes user identities with Skoruba STS (M24); logs SyncUser in AuditLogs (#2) .
GET	/v1/api/users/{userId}/status/{status}	Retrieves, verifies, or transitions user account status (UpdateUserStatus).

9.2 Tag Group 2: Projects & Work Breakdown Execution Endpoints (23 Operations — SRS M04/M10/M13/M15/M16/M17)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
POST / GET / PUT	/v1/api/projects	Creates (POST), searches (GET), or updates (PUT) records in Projects (#21) (FR-M04-001..021).
POST / PUT	/v1/api/projects/programme	Associates (POST) or updates (PUT) FK_Projects_Programmes_ProgrammeId mappings.
POST / PUT	/v1/api/projects/activities	Creates (POST) or updates (PUT) WBS rows in Activities (#1) (FR-M04-003, CreateActivityRequest).
GET	/v1/api/projects/{projectId}/activities	Retrieves all WBS activities linked to projectId via FK_Activities_Projects_ProjectId .
GET	/v1/api/projects/activities/{activityId}	Retrieves detailed activity telemetry from Activities (#1) by activityId .
POST / PUT	/v1/api/projects/beneficiaries	Registers (POST) or updates (PUT) demographic rows in Beneficiaries (#4) (M13, CreateBeneficiaryRequest).
GET	/v1/api/projects/{projectId}/beneficiaries	Retrieves all beneficiaries linked to projectId via FK_Beneficiaries_Projects_ProjectId .
GET	/v1/api/projects/beneficiaries/{beneficiaryId}	Retrieves individual beneficiary details from Beneficiaries (#4) .
POST	/v1/api/projects/beneficiaries/outcomes	Registers outcome rows in Outcomes (#18) bound via FK_Outcomes_Beneficiaries_BeneficiaryId (FR-M13-005).
POST / PUT	/v1/api/projects/changerequests	Submits (POST) or approves/updates (PUT) variations in ChangeRequests (#6) (M15, AT-09).
GET	/v1/api/projects/{projectId}/changerequests	Retrieves all change requests filed for projectId .
GET	/v1/api/projects/changerequests/{changeRequestId}	Retrieves details for a specific changeRequestId .
POST / PUT	/v1/api/projects/complianceitems	Creates (POST) or verifies/updates (PUT) rows in ComplianceItems (#7) (M10, AT-08).
POST / PUT	/v1/api/projects/issues	Logs (POST) or updates (PUT) operational issues in Issues (#14) (M16, FK_Issues_Users_AssignedTo).
POST / PUT	/v1/api/projects/sitevisits	Logs (POST) or updates (PUT) field inspection checklists in SiteVisits (#24) (M17, FR-M17-001..008).

9.3 Tag Group 3: Grants, Awards, Budgets & Contracting Endpoints (15 Operations — SRS M01/M02/M05/M14)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
POST / GET / PUT	/v1/api/grants/awards	Registers (POST), lists (GET), or updates (PUT) statutory awards in Awards (#3) (M01, BR-001/002, AT-01).
GET	/v1/api/grants/awards/{awardId}	Retrieves detailed grant award metadata from Awards (#3) by awardId .
POST / GET	/v1/api/grants/budgets	Creates (POST) or lists (GET) project budget structures in Budgets (#5) (M05, AT-04).
GET	/v1/api/grants/budgets/{budgetId}	Retrieves specific budget line details from Budgets (#5) by budgetId .

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
POST / GET / PUT	/v1/api/grants/contracts	Generates (POST), lists (GET), or updates (PUT) agreements in Contracts (#8) (M02, FK_Contracts_Awards_AwardId).
POST	/v1/api/grants/contracts/execute	Executes and locks a formal grant contract as Active (Locked) under Maker-Checker rules (FR-M02-020, AT-02).
GET / POST	/v1/api/grants/contracts/{contractId}	Retrieves metadata/hash (GET) or submits workflow actions/replacements (POST) for contractId .
GET	/v1/api/grants/contracts/{contractId}/terms	Retrieves statutory terms, obligations, and payment conditions attached to contractId (FR-M02-008..011).
GET	/v1/api/evidence/{evidenceId}/securelink	Generates a 15-minute ephemeral pre-signed S3 URL for secure PDF contract/evidence download (M14).

9.4 Tag Group 4: Governance, Portfolios, Organisations & Multi-Tenancy Endpoints (25 Operations — SRS M03/M20/M22/M23/M25)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
GET	/v1/api/governance/dashboard	Retrieves macro Executive Portfolio Dashboard KPIs (Dashboard D01, M20/M22, AT-11).
POST	/v1/api/governance/auditlog	Logs or queries immutable governance audit trail events in AuditLogs (#2) (M25, AT-12).
PUT	/v1/api/grants/budgets	Modifies budget allocations under portfolio governance policy constraints (M05/M15).
POST / PUT	/v1/api/governance/instruments	Creates (POST) or updates (PUT) configurable funding instruments in Instruments (#12) (BR-006, NFR-009).
GET	/v1/api/governance/instruments/{programmeId}	Retrieves governance instrument details bound to programmeId via FK_Instruments_Programmes_ProgrammeId .
POST / GET / PUT	/v1/api/governance/organisations	Registers (POST), lists (GET), or updates (PUT) legal entities in Organisations (#17) (M03, FR-M03-013).
GET	/v1/api/governance/organisations/{organisationId}	Retrieves details for a specific organisationId from Organisations (#17) .
GET	/v1/api/governance/organisations/{organisationId}/programmes	Lists programmes operated by or associated with organisationId .
POST / PUT	/v1/api/governance/organisations/portfolios	Maps (POST) or updates (PUT) an organisation's association with a governance portfolio (FK_Portfolios_Organisations_OrganisationId).
POST	/v1/api/governance/organisations/portfolios/{portfolioId}/organisations	Associates multiple organisations with a specific portfolioId .
GET	/v1/api/governance/portfolios/{portfolioId}	Retrieves strategic portfolio details from Portfolios (#19) by portfolioId (M20).
GET	/v1/api/governance/portfolios/{portfolioId}/programmes	Retrieves all programmes under portfolioId via FK_Programmes_Portfolios_PortfolioId .
GET	/v1/api/governance/portfolios/{portfolioId}/projects	Retrieves all funded projects rolled up under portfolioId (BR-010).
GET	/v1/api/governance/programmes/{portfolioId}	Retrieves programmes listed under a parent portfolioId .
GET	/v1/api/governance/programmes/{programmeId}	Retrieves specific programme configuration from Programmes (#20) by programmeId .
POST / GET / PUT	/v1/api/governance/tenants	Provisions (POST), lists (GET), or updates (PUT) isolated partitions in Tenants (#27) (M23, NFR-007).
GET	/v1/api/governance/tenants/{tenantId}	Retrieves metadata for a specific tenantId partition from Tenants (#27) .

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
GET	/v1/api/governance/tenants/{tenantId}/organisations	Lists scoped legal entities in TenantOrganisations (#25) mapped under tenantId (Figure 8.1).
GET	/v1/api/governance/tenants/{tenantId}/users	Lists authorized users in TenantUsers (#26) provisioned under tenantId (Figure 8.2).

9.5 Tag Group 5: Execution, Tranche Disbursements & Risk Registers Endpoints (13 Operations — SRS M06/M09/M23)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
POST	/v1/api/execution/disbursements/{disbursementId}/approve	Approves a verified disbursement request and releases payout (M06, BR-003, AT-05 , Maker-Checker enforced).
POST / GET / PUT	/v1/api/execution/disbursements	Requests (POST), lists (GET), or updates (PUT) tranches in Disbursements (#9) (FK_Disbursements_Milestones_MilestoneId).
GET	/v1/api/execution/disbursements/{disbursementId}	Retrieves details for a specific disbursementId from Disbursements (#9) .
POST / GET / PUT	/v1/api/execution/risks	Logs (POST), lists (GET), or updates (PUT) project/ESG risk entries in Risks (#22) (M09/M11, AT-07).
GET	/v1/api/execution/risks/{riskId}	Retrieves specific risk entry details from Risks (#22) by riskId .
POST / PUT	/v1/api/execution/rules	Configures (POST) or updates (PUT) statutory execution and gate rules in Rules (#23) (BR-006, M23).
GET	/v1/api/execution/rules/{ruleId}	Retrieves execution rule details from Rules (#23) by ruleId .
POST	/v1/api/execution/programmes/rules	Binds and configures execution rules at the parent programme level (FK_Rules_Programmes_ProgrammeId).

9.6 Tag Group 6: Evidence & M&E Endpoints (11 Operations — SRS M07/M08/M11/M12/M14/M19)

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
PUT	/v1/api/evidence/file	Uploads supporting evidence file to S3 and registers metadata in Evidences (#10) (M14, BR-004, AT-06).
PUT	/v1/api/evidence	Updates evidence verification status (Verified / Rejected) in Evidences (#10) (FR-M07-006/007).
GET	/v1/api/evidence/{evidenceId}	Retrieves evidence metadata and verification audit state from Evidences (#10) .
GET	/v1/api/evidence/files/{page}/{pageSize}	Retrieves a paginated list of uploaded evidence files for the Verification Queue (Figure 7.2).
GET	/v1/api/evidence/{projectId}	Retrieves all deliverable evidence documents linked via FK_Evidences_Projects_ProjectId .
POST	/v1/api/evidence/milestones	Registers contractual project milestones in Milestones (#15) (M07, CreateMilestoneRequest).
GET	/v1/api/evidence/milestone/{milestoneId}	Retrieves milestone completion and verification details from Milestones (#15) .
POST	/v1/api/evidence/indicators	Registers KPIs in Indicators (#11) with baseline and target values (M08/M11/M12/M19, BR-009).
POST / GET	/v1/api/evidence/indicators/{indicatorId}	Submits realized actuals (POST) or retrieves RAG variance details (GET) for indicatorId (AT-06).
GET	/v1/api/evidence/indicators/{page}/{pageSize}	Retrieves a paginated list of tracked M&E indicators across the tenant.

9.7 Tag Group 7: Communications, Mailbox & Invitations Endpoints (10 Operations — SRS M03/M16) & Schema Models

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
POST / PUT	/v1/api/communications/notifications	Dispatches (POST) or updates (PUT) In-App/Email messages in Notifications (#16) (Figures 7.3 & 7.4).
GET	/v1/api/communications/notifications/inbox	Retrieves In-App mailbox notifications for the authenticated user (FK_Notifications_Users_Recipient).
GET	/v1/api/communications/notifications/user/{userId}	Retrieves notifications dispatched to a specific userId .

Method	Endpoint Route	Operation Summary & ERD Table / SRS Mapping
GET	/v1/api/communications/notifications/{notificationId}	Retrieves full message body and metadata from Notifications (#16) .
POST	/v1/api/communications/invites	Issues onboarding invitations in Invites (#13) linked to Awards, Contracts, and Organisations (M03) .
GET	/v1/api/communications/invites/{page}/{pageSize}	Retrieves a paginated list of dispatched invitations from Invites (#13) .
GET	/v1/api/communications/invites/applications	Retrieves submitted recipient onboarding invitation applications (M03).
GET	/v1/api/communications/invites/{applicationId}	Retrieves specific invitation application details by applicationId .
GET	/v1/api/communications/applicants/{applicantId}	Retrieves profile and onboarding verification details for applicantId (M03) .

OpenAPI 3.1.1 Schema Models (31 Registered Schemas): The specification defines 10 core entity models (**Activity, AuditLog, Award, Beneficiary, Budget, ChangeRequest, Claim, ClaimsIdentity, ComplianceItem, Contract**), 4 lifecycle status enums (**ActivityStatus, ApprovalStatus, ComplianceStatus, ContractStatus**), and 17 CQRS request DTOs (**AddUserClaimRequest, CreateActivityRequest, CreateAwardRequest, CreateBeneficiaryRequest, CreateBudgetRequest, CreateChangeRequest, CreateComplianceItemRequest, CreateContractRequest, CreateDisbursementRequest, CreateIndicatorRequest, CreateInstrumentRequest, CreateIssueRequest, CreateMilestoneRequest, CreateNotificationRequest, CreateOrganisationRequest, CreateOutcomeRequest, CreatePortfolioRequest**).

10. Canonical Documentation, Blueprint & Platform Reference Index

All blueprint requirements, database schemas, architectural specifications, role matrices, and OpenAPI v1 endpoints presented in this manual are grounded in the canonical sources listed in Table 10.1:

Resource Identifier	Resource Type	Canonical URL / Repository Source
PFM System Requirements Specification v2.0 (PFM_SRS_v2_review.pdf)	Founding IEEE 830 Blueprint (S Phiri, 13 Aug 2026)	Attached SRS v2.0 Baseline (60 Pages, 25 Modules, 304 FRs, 10 BRs, 10 NFRs, 14 ATs)
PFM Physical PostgreSQL Database Schema (ERD.erd)	DBeaver Physical ERD XML	Attached ERD.erd (public schema, 29 Tables, 104 Foreign Key Relations)
PFM Platform Overview (README.md)	Repository Documentation	https://gitea.khongisa.co.za/ifritechnologies/pfm/src/branch/main/README.md
PFM Architectural Specification v2.0 (Architecture.md)	Architecture & RBAC Spec	https://gitea.khongisa.co.za/ifritechnologies/pfm/src/branch/main/Architecture.md
PFM Operational Grant Lifecycle v2.0 (Processes.md)	Lifecycle & Workflow Spec	https://gitea.khongisa.co.za/ifritechnologies/pfm/src/branch/main/Processes.md
PFM Console Brand Emblem (favicon.svg)	Application Badge / SVG Asset	https://console.ifri.khongisa.co.za/favicon.svg
PFM REST API Gateway & Scalar OpenAPI v1.0.0	Interactive OpenAPI 3.1.1 Spec	https://api.ifri.khongisa.co.za/openapi/v1/
PFM Executive Governance Console (ConsoleUI) & STS	Production Web Portal & OIDC STS	https://console.ifri.khongisa.co.za https://sts.security.khongisa.co.za