# PixelAfrica

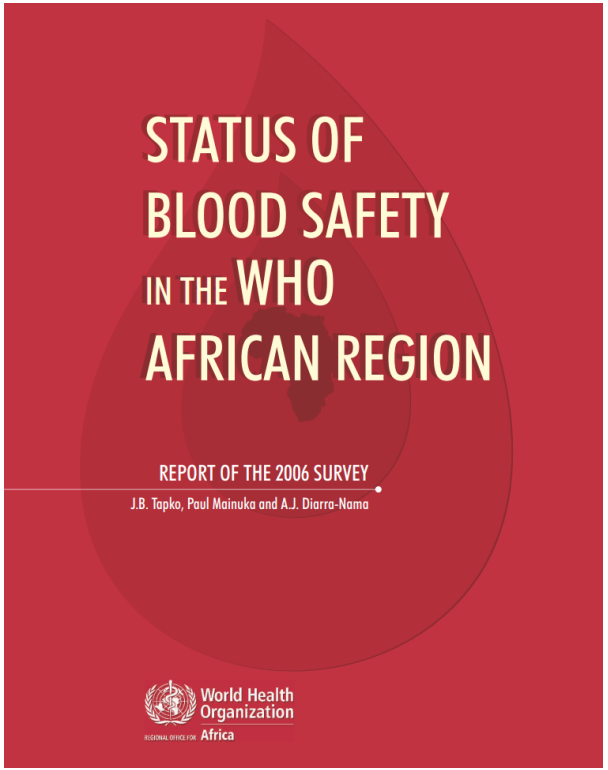
**One Pixel, One Life.**

(Hedera Africa Hackathon)

(Built on Hedera)

# Problem

- Africa needs **~8 million units** of blood per year.
- Only **~41% of this demand** is currently met.
- Many countries collect less than half of what they need.
- Wastage still happens (e.g., ~6.6% discard rate in a Ghana study).
- Blood logistics often rely on fragmented systems.




**Sources:**

- **World Health Organization: Status of Blood Safety in the WHO African Region**
- **Science Publishing Group: Ghana discard rate study**

# Why It Matters

- Delays & shortages directly impact maternal mortality, trauma care, and surgeries.
(Source: WHO - Blood Safety and Availability Fact Sheet)

- Up to 25% of maternal deaths in parts of Africa are linked to lack of safe blood.
(Source: WHO - Maternal Mortality data)

- Traffic accidents and trauma cases continue to rise, increasing demand for blood.
(Source: WHO Africa - Road safety statistics)

- Hospitals often cannot verify where a unit came from or its full handling history.
(Source: WHO African Region blood logistics challenges)

- Without traceability, expired or mishandled units may be used or discarded late.
(Source: WHO African Region – quality and safety challenges)

# PixelAfrica - The Solution

**PixelAfrica** gives every blood unit a clear timeline (created, moved, and finalized) all signed by real wallets and locked on Hedera so nothing can be altered.

# How It Works

- **Pixel Grid Visualization:**
  - One blood bag = one colored pixel.
  - Status: Created, In-Transit, Received, Transfused, Expired, Discarded
- **Role-Based Actions:**
  - **Donor Centers:** Register new bags
  - **Couriers:** Update transit info
  - **Hospitals:** Finalize bag status
- **Public Verification:**
  - Anyone can view a blood bag's full journey without a login.
- **Immutable Event Log:**
  - Each action is wallet-signed
  - Every update is written to HCS (immutable + timestamped)
  - Mirror Nodes show the complete history

# Demo

https://pixel-africa.vercel.app/

PixelAfrica dApp

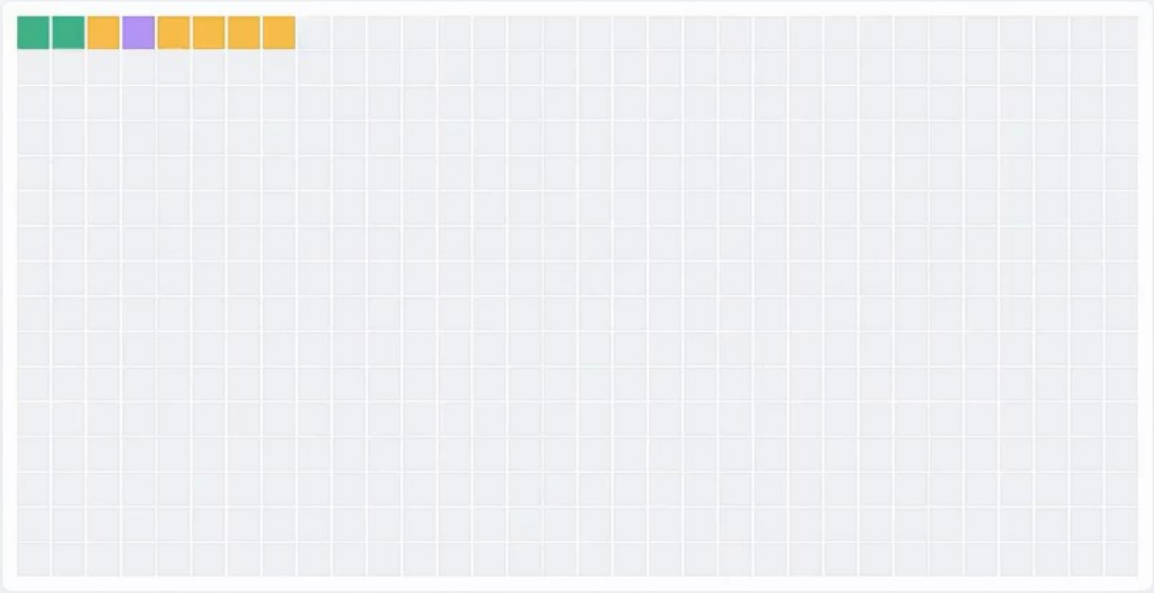
pixel-africa.vercel.app

# PixelAfrica

A clear, honest view of where blood is.

Each square is a bag. The color tells you what's happening now. Click a pixel to see its trail, end to end.

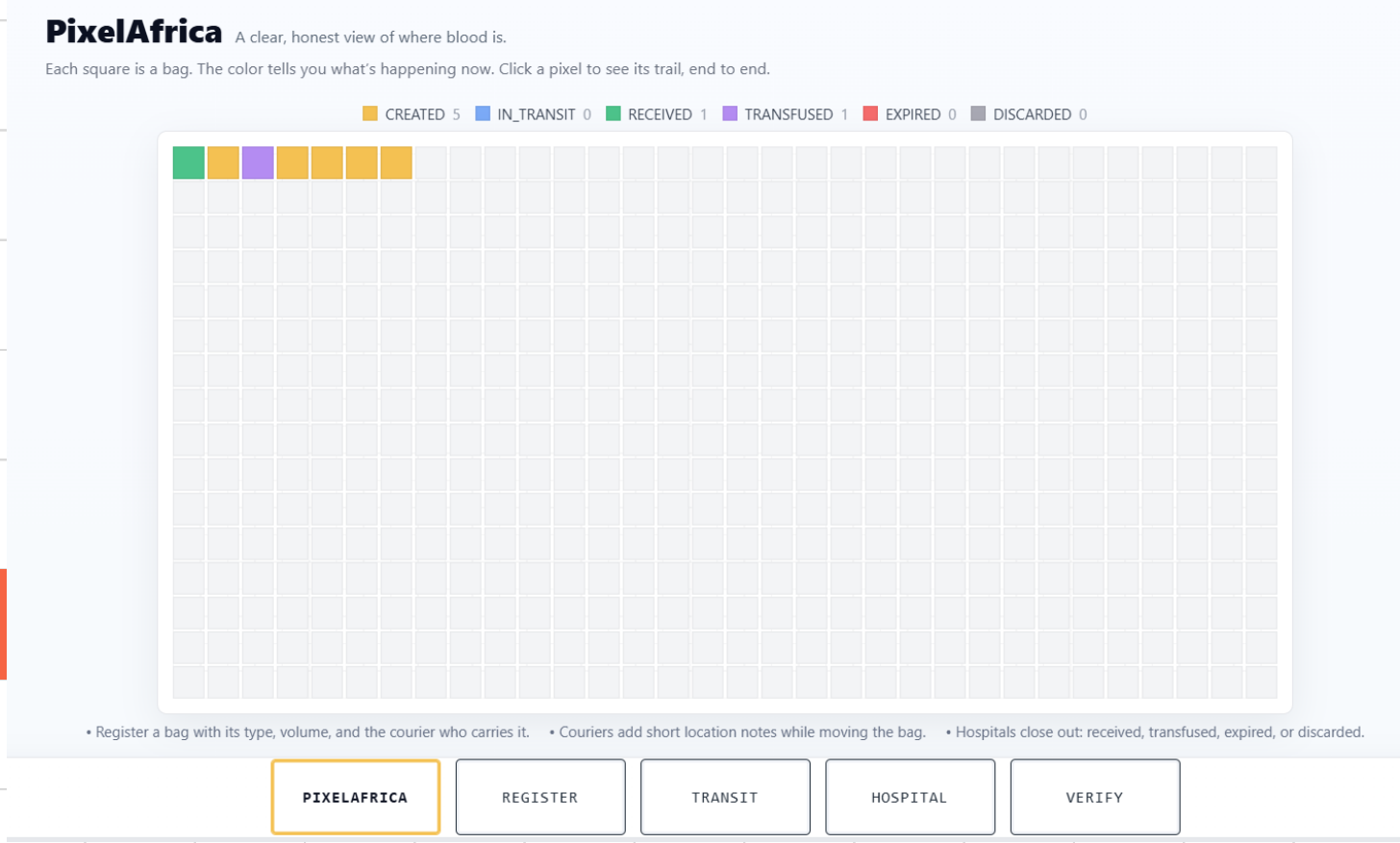
CREATED 5 IN_TRANSIT 0 RECEIVED 2 TRANSFUSED 1 EXPIRED 0 DISCARDED 0



• Register a bag with its type, volume, and the courier who carries it. • Couriers add short location notes while moving the bag. • Hospitals close out: received, transfused, expired, or discarded.

PIXELAFRICA | REGISTER | TRANSIT | HOSPITAL | VERIFY

# PixelAfrica



# Register

**Single** Batch

Bag ID (Donation/Unit ID)

Component

Red Cells (RBC)

Preservative / Additive

AS-1

Donation Type

Voluntary

Blood Type

O+

Volume (ml)

450

Collection Site ID (optional)

Site code / center ID

☑ Leukoreduced ☐ Irradiated ☐ CMV-negative

Courier Wallet ID

e.g. 0.0.12345

Hospital Wallet ID

e.g. 0.0.67890

Storage: **1–6 °C (refrigerated)**
Expiry: **~42 days** from collection

**Register Unit**

# Transit

## Transit Updates

Couriers can log transport updates for blood packages. Use quick-select events or add custom notes if needed.

hedera1

Fetch

Assigned Courier: 0.0.6879329

### Add Transit Update

Arrived at checkpoint

Successful

Add Update

### Timeline

**RECEIVED**
10/30/2025, 12:14:55 PM – 0.0.6879329

**CREATED**
10/30/2025, 11:18:56 AM – 0.0.6879329

# Hospital

## Bag hedera1 (RECEIVED)

**Blood Type:** O+

**Volume:** 450 ml

**Component:** RBC

**Donation Type:** VOLUNTARY

**Additive:** AS-1

**Collection:** 10/30/2025, 11:18:56 AM

**Expiry:** 12/11/2025

**Attributes:** leukoreduced

Successful

### Update Status

Mark Received | Mark Tested | Mark Ready | Mark Transfused | Mark Expired | Mark Discarded

### History

RECEIVED – – 10/30/2025, 12:14:55 PM – `0.0.6879329`

# Verify

## Verify Blood Bag

Enter a Bag ID or scan its QR. You'll see the bag's public details and lifecycle history.

hedera1

Search

### Bag hedera1 RECEIVED

**Blood Type:** O+

**Volume:** 450 ml

**Collection Date:** 10/30/2025

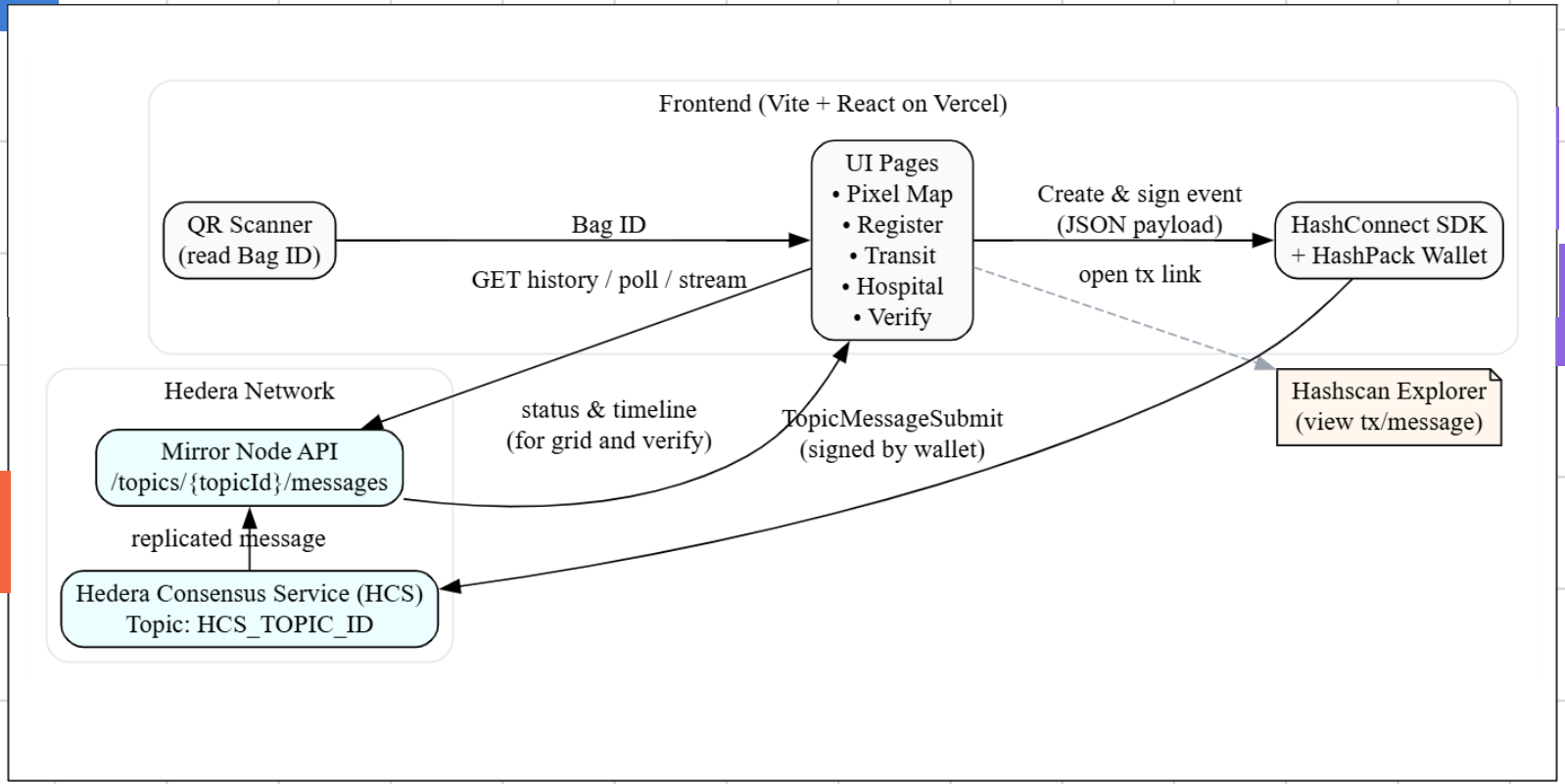
**Expiry Date:** 12/11/2025

**Timeline**

RECEIVED
10/30/2025, 12:14:55 PM

CREATED
10/30/2025, 11:18:56 AM

# Architecture Diagram



# Cross-Institution Transparency

## Cross-Institution Visibility

- ❑ All institutions share the same record
- ❑ No conflicting logs or missing updates
- ❑ One timeline across Donor → Courier → Hospital

## Tamper-Proof History

- ❑ Every action is wallet-signed
- ❑ HCS stores events immutably
- ❑ No edits, no deletions, no re-ordering

# Privacy & Role Access

| Field | Public | Courier | Hospital | Donor Center |
|---|---|---|---|---|
| Bag ID | ✓ | ✓ | ✓ | ✓ |
| Blood Type | ✓ | ✓ | ✓ | ✓ |
| Component Type (RBC/Plasma) | ✗ | ✓ | ✓ | ✓ |
| Status (Created/InTransit/etc.) | ✓ | ✓ | ✓ | ✓ |
| Timeline (HCS Events) | ✓ | ✓ | ✓ | ✓ |
| Courier Notes | ✗ | ✓ | ✗ | ✗ |
| Hospital Notes | ✗ | ✗ | ✓ | ✗ |
| Donor/Patient Personal Info | ✗ | ✗ | ✗ | ✗ |

- **Couriers can only edit their own transport events; Hospitals & donor centers edit their own stages**
- **No patient info is ever recorded!!**

# Why Hedera

- **ABFT security** → highest grade in distributed systems
- **Fair ordering** → every update gets a trusted global timestamp
- **Carbon-negative network** → sustainability built in
- **Low, predictable fees** → perfect for high-volume supply chains
- **High throughput** → handles thousands of small events easily
- **Public auditability** → anyone can verify history without permissions
- **No miners, no forks** → stable performance, no congestion

# Deployment Strategy

**Deployment depends on approval from the National Blood Service and the Ministry of Health.** Because PixelAfrica sits on top of **existing workflows**, regulators treat it as an **operational visibility layer**, not a new medical system. After authorization, the NBS selects **one blood bank** unit for a **4–6 week pilot** where staff only update bag status with a **Hedera-signed wallet.** Funding covers **regulatory compliance**, documentation, training, and dashboards. **Pilot results** then guide ministry decisions on **nationwide rollout.**

# Potential

- Africa needs **8–10M blood units/year**, yet **~59% of demand is unmet or delayed**.

- Improving traceability by just **2–3%** returns **160k–240k usable units per year** with **no new hardware** and **ops cost <$0.01/event**.

- Hospitals that adopt a unified timeline typically cut wastage **by 40–60%**.

Once proven in blood logistics, the same architecture applies to vaccines, medical supplies, food relief, and clothing distribution, any chain where governments need cheap, shared, tamper-proof coordination.
PixelAfrica can scale into multiple sector-specific “pixel maps”, each tracking a different life-critical supply with the same underlying design.

# Roadmap

- **Phase 1: Infrastructure & "Shadow" Prep (Jan – Feb)**
- **Phase 2: Live Pilot Execution (March)**
- **Phase 3: Productization & Scale (April)**
- 🛡️ **Risk Mitigation Strategy**

(continued)

# Phase 1: Infrastructure & "Shadow" Prep

**Focus:** Security Hardening & operational setup while waiting for funding.

❖ **Timeline:** Jan 1 – Feb 28

❑ **Technical Deliverables:**

- **Offline-First Logic:** Implement useHcs queue system for low-connectivity environments.
- **Security Audit:** Internal review of key management workflows.

❑ **Operational Deliverables:**

- **"Shadow" Setup:** Establish relationship with 1 Private Clinic or NGO partner (Backup plan if Gov is slow).
- **Hardware Prep:** Procure and configure pilot devices (Tablets).

# Phase 2: Live Pilot Execution

**Focus:** Generating On-Chain Data.

❖ **Timeline:** March 1 – March 31

❑ **Scope:** 1 Partner Site (Clinic or NGO).

❑ **Deliverable:** Track 100+ Asset Movements on-chain.

❑ **Safety Net:** If Blood Service approval is delayed, we execute this pilot with **Medical Supplies** (gloves/syringes) at a private partner to guarantee data generation for the grant report.

# Phase 3: Productization & Scale

**Focus:** Mobile App & Expansion.

❖ **Timeline:** April 1 – April 30

❑ **Technical Deliverable: Mobile App v1.0 (Android)** release. (Essential for high-volume scanning).

❑ **Operational Deliverable:** "Universal Logistics" Platform Pitch.

❑ **Action:** Present Phase 2 data to Ministry of Health/Investors to secure long-term contracts

# Risk Mitigation Strategy

**"What if the Blood Pilot is stalled?"** PixelAfrica is architected as a **Sector-Agnostic Logistics Engine**.

- The code tracks *Assets*, not just blood.
- **Trigger for Pivot:** If regulatory red tape significantly impacts the Blood Pilot timeline, we are prepared to pivot to **Vaccine Cold Chain** or **Disaster Relief**.
- **Collaboration:** This decision will be made **in strategic alignment with the Hedera Foundation**, ensuring our chosen secondary market drives the most value for the ecosystem.

# Links

- **Live Demo:** https://pixel-africa.vercel.app
- **Demo Video:** https://youtu.be/7joHzZael3o
- **X / Twitter:** https://x.com/PixelAfricaX
- **Source Code:** https://github.com/GokhanCey/pixel-africa
- **Pitch Deck:** https://github.com/GokhanCey/pixel-africa/PitchDeck.pdf

# PixelAfrica

***One Pixel, One Life.***

**Thank you.**