PixelAfrica

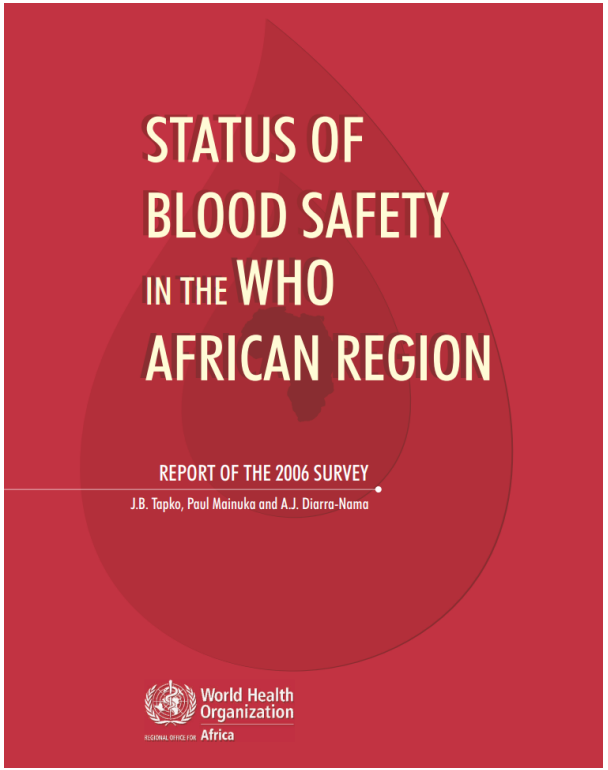
One Pixel, One Life.

(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

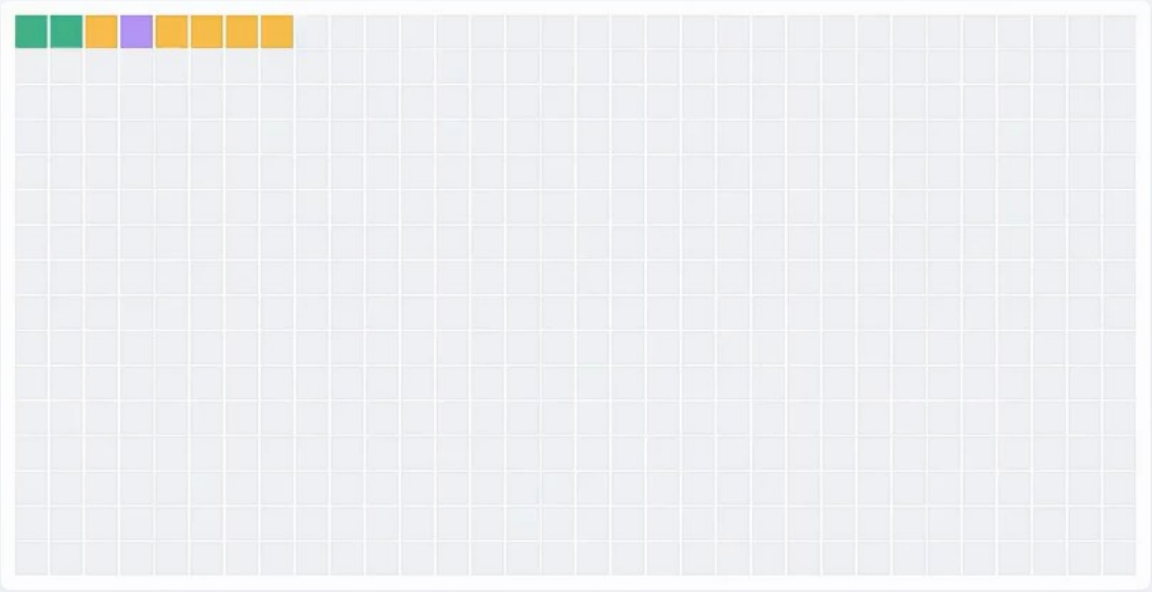
pixel-africa.vercel.app

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

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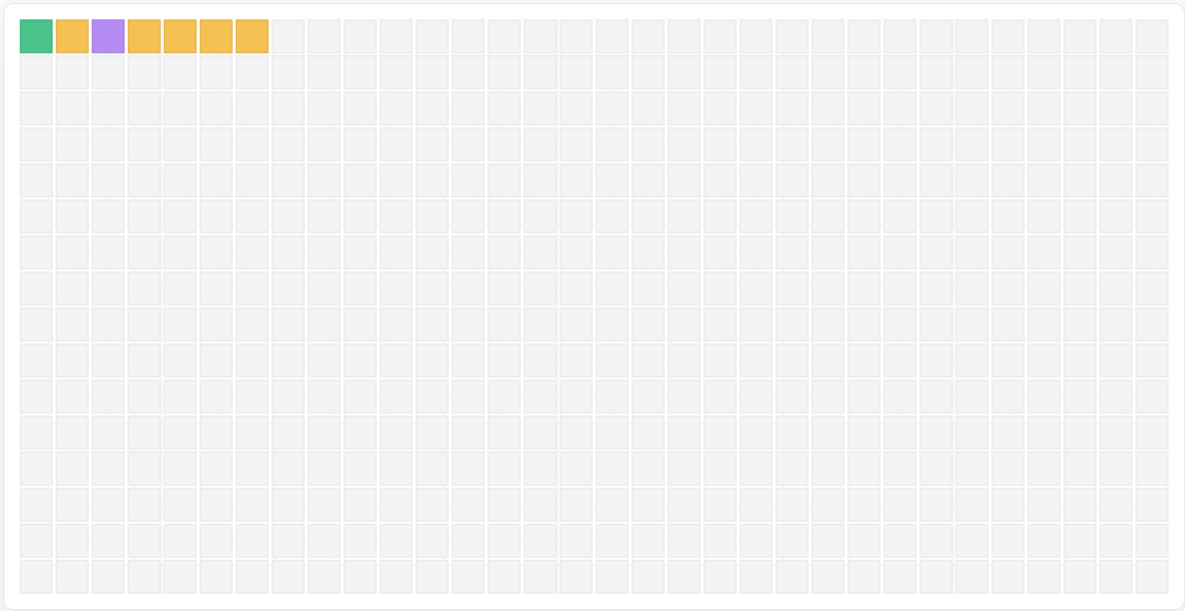
A clear, honest view of where blood is.

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 1 TRANSFUSED 1 EXPIRED 0 DISCARDED 0



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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

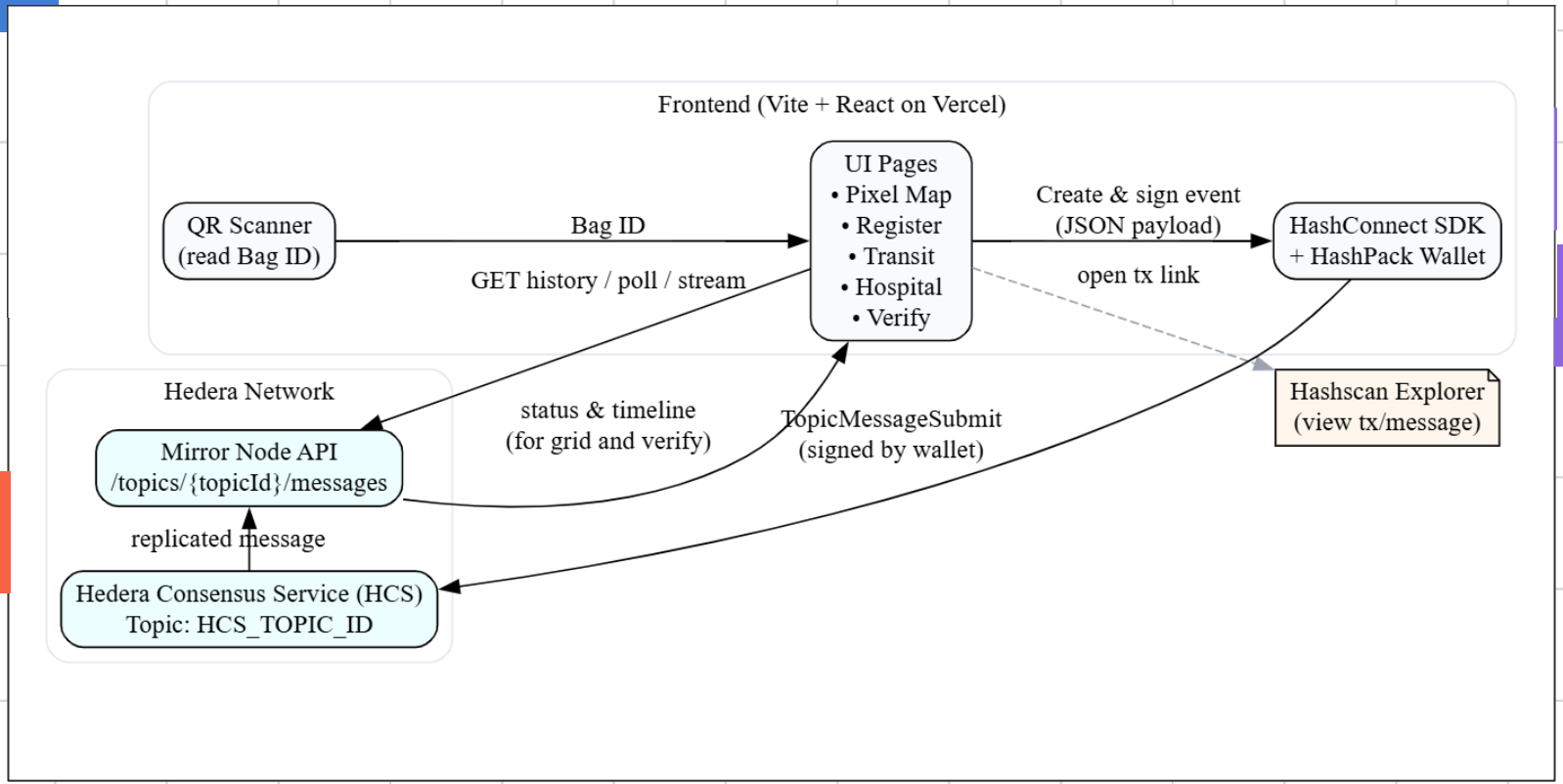
Expiry Date: 12/11/2025

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

- **Mobile app for couriers** (scanning + quick updates)
- **HTS tokenization** for unique bag identities
- **Smart contract roles** for automated permissions
- **Alerts and analytics** (expiry, shortages, routing)
- **Pilot rollout** across multiple hospitals

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

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Thank you.