

# TRACK BRIEF 01: MINA KULA — People of the 1,000-Year Trust

Phase 1 Deployment: Woodlark (Murua) Island | Release: 9 August 2026

Complete Track Brief — all 11 challenges

## CHALLENGE AT A GLANCE

**Objective:** Build the tamper-proof sovereign ledger, tactical mesh, canopy sentinel detection logic, offline identity rails, and dual-node verification dashboard that turns raw field data into immutable proof.

**Technical Baseline:** Edge hashing, non-line-of-sight tactical mesh, multi-orbit SATCOM, non-lithium storage, hardened ingress, dual-sensor telemetry, human-in-the-loop audit authority.

**Required Deliverables:** Architecture schematics, data-flow map, cryptographic protocol spec, and proof-of-concept evidence in whatever form fits your team's stage.

*A note before you read further: everything below is one way to solve this challenge, not the only way. It's meant to show you the shape of the problem clearly enough to work with, not to box you into a single design. Bring your own research, your own expertise, and tell us plainly what extra value your approach adds beyond what's written here — that's genuinely welcome, not a deviation to explain away. This is also a challenge, not the finished deployment: some things that belong to the real, on-the-ground project — like securing consent from customary landowners — aren't yours to demonstrate at this stage, and you won't be asked to. Read the Guidelines for Guardians to Unite alongside this brief for the fuller picture of how deployment actually works, logistics included.*

**Who can apply:** You can apply as a single person, a company, or a team — whatever shape your work actually takes. If more than one submission ends up solving the same piece of this puzzle, we'd rather introduce you to each other than make you compete: this is about uniting the right people around Ava, not picking a lone winner.

## 1. SYSTEM PLACEMENT & ROLE

**Where This Sits:** The central nervous system. Every kilowatt generated, every litre of water produced, every vessel mile sailed, every hectare monitored — across all six other tracks — flows through what you build here.

**Core Mission:** Construct the immutable sovereign ledger, encrypted mesh network, canopy sentinel detection and verification logic, offline biometric identity system, Kula Trade payment rail, and mirrored dual-node dashboard. Your work transforms raw sensor readings into verifiable, unalterable proof of protection — recognised by auditors, buyers, and the clans equally.

**Integration Rule:** Every hardware brief across the other six tracks assumes Mina Kula's connectivity, security, and data standards exist beneath them. You build the backbone.

## 2. WOODLARK ISLAND: WHAT YOU'RE ACTUALLY DESIGNING FOR

A real starting point, not the whole picture — go do your own deeper research from here. Facts below are sourced from public geographic and climate records; anything marked as an estimate is exactly that.

**Geography.** Woodlark Island is roughly 60km east-west and 30km north-south at its center, in the Solomon Sea, part of Milne Bay Province, centered around 9.13°S, 152.81°E. Highest point is Mount Kabat at 240m. The

island's own name is Muyuw, also called Murua.

**Population & settlements.** No formal census has been taken since 1990; an unofficial estimate puts the island's population around 6,000 today, spread thin. Kulumadau is the largest settlement, Guasopa second — Guasopa also holds the island's health centre, currently 9 health workers covering roughly 6,000 people across Woodlark and the surrounding islands. There is one primary school, in Kulumadau; every child leaves for Alotau to attend secondary school.

**Climate.** Warm and humid year-round, roughly 21–34°C. Wet season runs January through March, peaking in March. Southeast trade winds dominate the drier stretch, roughly May through November. Cyclone and tropical storm risk concentrates December through March.

**Access.** The route in runs through Alotau, Milne Bay Province's capital, then by sea to Woodlark — roughly 155–160 nautical miles by straight-line estimate; no verified figure exists for actual sea-route distance or travel time, so treat this as a rough planning estimate, not a fixed number.

### 3. THE TECHNICAL BASELINE

These fall into two tiers. A small number are hard constraints, marked [HARD CONSTRAINT] below — they protect physical safety, not architecture, and admit no exceptions. Everything else here is the reference bar for meeting each field challenge, not the only acceptable answer: if your team has a genuinely better way to solve the same problem, propose it. This challenge is evaluated on what actually works in the field, not on matching this document line for line.

- **Edge-Locked Cryptography:** Every sensor and meter hashes data locally at capture, binding readings to a hardware-unique identifier and immutable UTC timestamp before transmission.
- **Non-Line-of-Sight Tactical Mesh:** Encrypted, self-healing MANET-class mesh networking between nodes, engineered to penetrate dense tropical canopy and open water without a single point of failure.
- **Multi-Orbit Satellite Backhaul:** Gateways maintain simultaneous LEO/GEO connectivity via electronically-steered, metamaterial-aperture flat-panel antenna arrays, with automated frequency handover. No single network outage takes the system down.
- **Non-Flammable Storage by Design — [HARD CONSTRAINT]:** Sodium-ion or flow-battery chemistry only across all field nodes. No lithium enters the forest.
- **Hardware-Rooted Security:** Firewalls reject any payload not signed by a pre-authorised device key. Spoofed data cannot enter the ledger.
- **Human-in-the-Loop Oversight:** All automated systems remain auditable and stoppable by authorised guardians. Code serves people — never the other way around.
- **Working With Customary Land:** Free, Prior and Informed Consent with the registered customary landowners is led by Lyndax Global and the Samarai-Murua District Development Authority, as a real, ongoing relationship — it isn't something your submission needs to demonstrate or secure yourself, and you won't be asked to. Gateways, sentinels, and smart-card kiosks all get physically sited; design for flexible placement, not around a permission you don't have standing to obtain.
- **Field Durability, Anti-Theft & Ease of Use — [HARD CONSTRAINT]:** Anything deployed unattended in the field is built to survive years without regular maintenance, resist tampering or theft, and stay simple enough not to fail from ordinary misuse — this district is genuinely isolated, and a fragile or easily-defeated unit doesn't help anyone. This is about the real outcome (long unattended service life, tamper resistance, hard to get wrong), not a specific named spec like 'military grade': propose whatever achieves that outcome.

### 4. THE ELEVEN SUB-CHALLENGES — ONE BACKBONE

### 3.1

## Sovereign Ledger & Trust Architecture

### THE FIELD CHALLENGE

Commercial logging and illegal mining operate at the forest edge. Standard databases can be altered. You must build a ledger where a reading recorded in Kulumadau cannot be changed, deleted, or double-counted — even if servers are physically accessed.

### REFERENCE STANDARDS

- Immutable, edge-signed time-series ledger
- Zero-knowledge audit capability for Verra validators
- Double-claim prevention across Article 6.2 and voluntary markets
- Fixed reference plots to prevent baseline manipulation
- Automated cross-referencing of incoming data against expected environmental baselines before any asset is minted, with an authenticated human-in-the-loop channel able to freeze or manually audit anything the system flags — this is what the baseline's "human-in-the-loop oversight" requirement actually looks like in practice, not just a stated principle

### WHO SHOULD APPLY

Distributed ledger architects, cryptographic protocol engineers, trust-framework specialists.

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### 3.2

## Canopy Sentinel Detection & Verification Logic

### THE FIELD CHALLENGE

Chainsaws start deep under 30m canopy. Satellites pass too late. Optical sensors fail through foliage. The Forest Sentinel Totem that carries the physical sensors — its structure, power, battery, and connectivity — is built under Mina Valu's brief. What's yours to solve: the detection logic that turns raw acoustic, thermal, and visual signal from that hardware into a real, actionable alert.

### REFERENCE STANDARDS

- Acoustic classification tuned to recognise chainsaw signatures specifically, not just generic loud sounds — false alarms from a car backfiring three villages away help nobody
- Thermal-anomaly detection that tells the difference between an actual threat and ordinary wildlife or weather
- Canopy-density baselining that can detect real change over time, not just a single snapshot
- Feeds directly into 3.1's ledger and its automated baseline cross-referencing — detection and verification are one connected pipeline, not two separate tools

### WHO SHOULD APPLY

Signal-processing and sensor-fusion specialists, ML engineers with acoustic/thermal classification experience, ecologists who can help define what "anomalous" actually looks like in this forest.

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### 3.3

## Tactical Mesh & Satellite Backhaul

### THE FIELD CHALLENGE

Cyclone-strength winds destroy infrastructure. There is no cellular service. The network must self-heal and route critical alerts through canopy, through storm — without dropping data.

### REFERENCE STANDARDS

- Non-line-of-sight, self-healing MANET-class encrypted mesh between nodes
- Multi-orbit flat-panel gateways with seamless constellation handover
- Every packet cryptographically signed at origin

#### WHO SHOULD APPLY

RF and network engineers, SATCOM developers, embedded firmware specialists.

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### 3.4

## Offline Identity & ILG Smart Card System

### THE FIELD CHALLENGE

Rangers and landholders have no bank branches, no cellular service, no internet. Paper registers invite fraud. You must verify identity and authorise benefit payouts — entirely offline.

### REFERENCE STANDARDS

- Encrypted physical smart card storing biometric templates locally
- On-device matching — zero internet required at payout
- Deduplication at enrolment; cryptographically signed batch sync when back online

#### WHO SHOULD APPLY

Secure hardware designers, embedded IoT engineers, biometric and fintech developers.

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### 3.5

## River Silt & Dredging Telemetry

### THE FIELD CHALLENGE

Silt dredged for 3D-print aggregate must be measured by mass in real time — no manual weighing, no paper logs. Every tonne moved must be verifiable proof of work.

### REFERENCE STANDARDS

- Electromagnetic volumetric flow meter paired with an inline acoustic density scanner on the discharge line, calculating precise volumetric displacement and solid-mass weight composition automatically
- Data streamed directly to ledger — no manual entry

#### WHO SHOULD APPLY

Flow and acoustic sensor engineers, marine telemetry specialists.

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### 3.6

## Dual-Node Verification Dashboard & Digital Twin

### THE FIELD CHALLENGE

Two locations — SMDDA Headquarters (Woodlark) and Lyndax Command (Singapore) — must see identical data simultaneously. If records diverge, governance fails.

### REFERENCE STANDARDS

- Mirrored sub-second synchronisation between both nodes
- Unified visualisation across all seven tracks in real time

#### WHO SHOULD APPLY

Full-stack and backend engineers, 3D GIS and data-visualisation specialists.

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### 3.7

## Cybersecurity & Anomaly Detection

### THE FIELD CHALLENGE

Spoofed telemetry injected via satellite uplink could falsely mint credits. You must detect impossible readings — and block them — before they enter the ledger.

### REFERENCE STANDARDS

- Stateful inspection firewall at the network gateway, rejecting any payload that doesn't match a pre-authorised device's hardware-locked signature
- AI anomaly detection cross-checking readings against physical limits and expected environmental baselines
- Human override always available

### WHO SHOULD APPLY

Cybersecurity architects, AI/ML anomaly engineers, infrastructure security specialists.

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3.8

## Storage Health Telemetry & Predictive Monitoring

### THE FIELD CHALLENGE

The non-flammable storage baseline is already required on every device, engineered device-by-device — the totems under Mina Valu, the fixed district microgrid alongside them. What doesn't exist yet is the layer that watches all of it: nobody currently knows, fleet-wide and in real time, which node's storage is degrading before it fails in the field, 20km from the nearest technician.

### REFERENCE STANDARDS

- Continuous state-of-health telemetry (temperature, cycle count, degradation curve) from every sodium-ion and flow-battery unit across the whole system
- Predictive-failure alerting surfaced on the Mina Kula dashboard before a unit actually goes dark, not after
- Feeds directly into the ledger as verifiable uptime data, not a separate siloed monitoring tool

### WHO SHOULD APPLY

Power electronics engineers, battery health/BMS specialists, data engineers comfortable with time-series and predictive modeling.

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3.9

## Benefit-Distribution Payment Rail

### THE FIELD CHALLENGE

Carbon revenues due to landholders must reach them directly — no leakage, no middlemen, no cash. This is the formal, audited rail: institutional carbon revenue moving from the verified ledger to registered ILG members, reconciled against official records. It is a different system from 3.10's informal cultural exchange, built to a different standard of auditability, even though both may share underlying offline-transfer hardware.

### REFERENCE STANDARDS

- Direct integration with offline identity system
- Every transaction immutable and auditable
- Reconciliation against official ILG registers

### WHO SHOULD APPLY

Fintech developers, secure payment systems engineers.

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### 3.10

## The Kula Trade System — Cultural Value Exchange

### THE FIELD CHALLENGE

Western banking models do not fit traditional reciprocity. Value must move peer-to-peer, offline, in a way that honours Kula custom — modeled on the soulava (red shell necklace) and mwali (white shell armband) exchanged in the traditional Kula ring, the actual valuables this whole track is named for, not a generic wallet with a cultural skin over it. This is a distinct system from 3.9's formal carbon-revenue rail: informal, community-governed, cultural in purpose rather than institutional, even if it ends up sharing underlying transfer hardware.

### REFERENCE STANDARDS

- Offline peer-to-peer value transfer via smart card or local mesh
- Cultural design — a covenant, not just a wallet: any use of the Kula name or the soulava/mwali imagery specifically requires genuine sign-off from the Incorporated Land Groups themselves, not an internal branding decision
- Conversion to local currency at designated hubs

### WHO SHOULD APPLY

Fintech UX designers, mobile payment engineers, cultural-technology consultants.

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### 3.11

## Land-Sea-Air Corridor Reservation

### THE FIELD CHALLENGE

As vessel, drone, and eventually aircraft traffic grows, there is currently no coordination point for navigation or de-confliction, and no space reserved for one to exist later. This is scoped deliberately small for now: reserve the actual sea lanes, air corridors, and land routes within the GIS/boundary mapping work already underway — not the full real-time coordination hub. Geofenced live tracking, automated collision alerting, and active traffic management are intentionally deferred until real traffic volume justifies building them.

### REFERENCE STANDARDS

- Geofenced corridor and sacred-zone boundary definitions within the GIS layer
- A data schema ready to accept live position feeds later, without being built to actually process them yet
- A clear scoping document distinguishing what's reserved now from what's deferred

### WHO SHOULD APPLY

GIS and mapping engineers, systems architects interested in scoping this for a later phase.

## 5. WHAT TO SUBMIT

Teams applying to Mina Kula upload to [lyndax.org](https://lyndax.org):

- **System Architecture Package** — CAD schematics, network topology, cryptographic data-flow diagrams.
- **Telemetry Handoff Matrix** — exactly how sensor data moves from edge → mesh → gateway → ledger → dashboard.
- **Proof-of-Concept Evidence** — in whatever form best reflects where your team actually is — a working prototype, a bench-tested subsystem, evidence of a prior deployment, or a detailed feasibility case with supporting calculations. A polished video is welcome but not required; a rigorous feasibility case from an early-stage team is evaluated on its own merits, not penalised for lacking footage.

- **Rough Cost Estimate** — an order-of-magnitude budget for the specific challenge(s) you're addressing — not a binding quote. Early-stage teams can give a range; further-along teams can be more precise. This helps us plan against something real instead of guessing.

## 6. HOW THIS IS EVALUATED

Submissions are scored on three equal pillars:

- **Technical Integrity** — Does it meet the technical baseline — either as written, or with a genuinely better alternative?
- **Integration Readiness** — Does it plug cleanly into the rest of the build?
- **Guardian Spirit** — Was it designed for the clans, not just the spec sheet?

## 7. INTELLECTUAL PROPERTY

Any technology or intellectual property you bring into this challenge remains yours. What gets built specifically for this project is licensed to Lyndax Global and the Samarai-Murua District Development Authority for use here — not assigned, not sold, not owned by us. If your technology's use ever expands beyond this initial deployment, those terms will be set out clearly in your individual contract once you're selected — never assumed from this brief.

Questions or more detail before you submit? Reach Mina Kula directly at [kula@lyndax.org](mailto:kula@lyndax.org).

*This is a first-of-its-kind deployment, and this brief is a challenge document, not the final build — specifications are a starting point for direct engagement with applicant teams, not a fixed spec to execute silently. Full disclaimers and engagement terms are set out in the Guidelines for Guardians to Unite and the Eligibility & Disclaimers document. Submissions close 11 September 2026, 6:00pm Singapore time.*