

ATLAS™ — PROOF OF ENTROPY™

1 — Executive Overview

Atlas is a global, opt-in value layer that mints economic rewards from the measurable unpredictability produced by living humans.

Phones and wearables compute entropy scores privately on the device. Each short time window (“epoch”) earns two potential streams:

(1) a Universal Basic Income (UBI) floor that tracks local cost of living; and (2) variable rewards proportional to verified improvements

above a participant’s own baseline in health, learning, work, creativity, community participation, and environmental stewardship.

Activities that cause pain, suffering, disease, death, or ecological damage are ineligible by rule. Atlas is designed to coexist with

existing money systems and to minimize disruption while creating clear incentives for healthier, safer, more creative, and more sustainable lives.

2 — Problem Statement and Design Goals

Money today does not directly compensate the outcomes societies want: robust health, knowledge, safety, creativity, cooperation, and a living planet. In crypto, Proof of Work rewards electricity consumption, and Proof of Stake rewards existing capital.

Both can secure ledgers, but neither measures lived contribution. Atlas sets clear goals: (a) guarantee survival via UBI indexed to local costs;

(b) reward verifiable improvements relative to each person’s baseline; (c) preserve privacy by computing locally and publishing only proofs;

(d) exclude harmful activity categorically; (e) remain optional and interoperable with fiat and existing chains; and (f) provide governance that is transparent and constitutional.

3 — Entropy in Plain Language and Math

In information theory, entropy quantifies unpredictability. For a source X with outcomes x and probabilities $p(x)$, Shannon entropy is $H(X) = -\sum p(x) \log p(x)$.

Human signals are richly structured and never perfectly repeat: step patterns, gait, heart-rate variability (HRV), breathing cadence, keystroke timings, routes, speech micro-timings, and creative outputs. Atlas transforms these time-series into verifiable entropy scores using established metrics:

- Shannon entropy and min-entropy (H_∞) for conservative bounds;
- Sample/Approximate Entropy (SampEn/ApEn) for physiological irregularity;
- Permutation and spectral entropy for order and frequency structure;

- Lempel-Ziv complexity for algorithmic novelty;
- Divergence from self-history via Jensen–Shannon divergence (JSD) to quantify novelty without comparing people to each other.

4 — Signals and Data Model (On-Device)

Commodity devices capture what is needed today: accelerometer, gyroscope, barometer (motion, posture, micro-jitter, gait); GPS trajectories and dwell/transition patterns (location);

interaction timings (keystrokes, touch dynamics); optional voice features and micro-expressions processed locally; and simple signed attestations from providers, employers, schools, and organizers.

No raw personal data leaves the device. The device computes features per sliding window and discards signals after constructing cryptographic proofs of the results.

5 — Baselines and Personalization

Each participant maintains a rolling personal baseline H_0 using robust statistics over a window (e.g., 30 days). Baselines adapt to life changes without overreacting to short anomalies.

For epoch t , the device forms a normalized metric vector m_t and computes $\Delta_t = m_t - H_0$. Positive Δ_t reflects improvement relative to your own past, not to another person's history. This protects inclusivity: a person who is unwell still receives UBI; small, safe gains above their baseline are recognized proportionally.

6 — Scoring Function and Worked Examples

Per epoch t , Atlas computes a combined score:

$$\text{SCORE}_t = \alpha \cdot \text{clip}(\text{mean}(\Delta_t), 0, \kappa) + \beta \cdot N_t + \gamma \cdot O_t + \delta \cdot C_t + \varepsilon \cdot S_t.$$

- Δ_t : improvement above self-baseline across metrics (clipped to $[0, \kappa]$ to discourage unsafe spikes).
- N_t : novelty vs self-history via JSD.
- O_t : originality of creative/intellectual outputs in $[0,1]$ using on-device appraisal against personal history and public baselines.
- C_t : verified community participation (signed attendance for marathons, concerts, meetings, rallies, pilgrimages, festivals, classes).
- S_t : verified environmental stewardship.

Weights $\alpha \dots \varepsilon$ and cap κ are set by governance.

Worked illustration (simplified): If your Δ_t averages 0.6 (capped), $N_t = 0.2$, $O_t = 0.4$, $C_t = 0.0$, $S_t = 0.1$, and weights are $\alpha=2$, $\beta=1$, $\gamma=1.5$, $\delta=1$, $\epsilon=1$, $\kappa=0.8$, then $\text{SCORE}_t \approx 2 \cdot 0.6 + 1 \cdot 0.2 + 1.5 \cdot 0.4 + 0 + 1 \cdot 0.1 = 1.2 + 0.2 + 0.6 + 0 + 0.1 = 2.1$ for that epoch.

7 — Proof of Life and Identity (Privacy-Preserving)

Atlas binds rewards to living humans without building a centralized biometric database. Devices run randomized liveness prompts (gesture/posture tasks), secure enclave key storage, device attestation, and periodic re-binds. Where users consent, in-person checks can be performed by trusted institutions. The goal is to resist bots and farms while respecting privacy and maintaining accessibility.

8 — Proof Construction and Verification (Commit-and-Prove)

Each epoch:

- 1) Commit: $c_t = H(\text{hash}(\text{inputs}_t \parallel \text{nonce}_t))$ binds to inputs.
- 2) Compute: derive SCORE_t and threshold claims (e.g., $\text{SCORE}_t \geq \theta$, $N_t \geq n^*$, $O_t \geq o^*$).
- 3) Prove: build zero-knowledge proofs for claims; raw signals are never uploaded.
- 4) Attest (optional): attach simple signed facts (e.g., therapy attended, exam completed, event participated, restoration action verified).
- 5) Publish: submit (c_t , proofs, attestations) to mempool.
- 6) Verify: validators check proofs and signatures and aggregate population scores.
- 7) Finalize: mint UBI first; allocate variable rewards proportionally thereafter.

9 — Network Architecture and Consensus Options

Atlas may launch as: (a) an app-chain with BFT consensus and constitutionally bounded issuance; (b) a zero-knowledge rollup posting validity proofs to a secure L1; or (c) a dedicated L1 with PoE™ native.

Validator duties: verify ZK proofs, validate attestations, prevent censorship, aggregate issuance, and publish state. Slashing applies to provable malfeasance.

The choice depends on cost, throughput, and governance requirements; all options preserve privacy and prioritize UBI before variable rewards.

10 — Issuance, UBI Guarantee, and Inflation Control

Let $C_i(t)$ be the local cost of living for person i . The protocol sets $U_i(t) \geq C_i(t)$. Per epoch, issuance decomposes into:

- $\text{UBI}_{\text{mint}} = \sum_i U_i(t)$ (first priority)
- $\text{VAR}_{\text{mint}} = \lambda \cdot \sum_i \text{SCORE}_i(t)$ (issuance throttle λ)

Allocation order: satisfy UBI_{mint} ; distribute $\text{VAR}_{\text{mint}} \propto \text{SCORE}_i / \sum \text{SCORE}$.

Inflation is controlled by adjusting λ with transparent governance, using audited cost-of-living oracles, and employing savings/staking modules to buffer UBI when demand spikes.

Merchants and governments that accept Atlas increase demand without compromising privacy.

11 — Cost-of-Living Oracles and Audits

Cost-of-living indices combine diverse sources: public statistics, NGO datasets, merchant baskets, and privacy-preserving receipt aggregation.

Robust estimators reduce outlier impact. Oracles are open, auditable, and challengeable by communities. Appeals allow correction of obviously wrong local indices.

Transparency of methods and monthly reports is mandatory.

12 — Participation Layer: Health

Background participation comes from sleep, steps, breathing cadence, and routine movement. Improvements include meeting medical activity guidelines, therapy sessions, medication adherence, safe training load, HRV complexity gains, and clinically advised recovery. Dangerous conduct is ineligible regardless of metric values. The focus is on steady, sustainable health, not unsafe spikes.

13 — Participation Layer: Work and Learning

Blue-collar signals: verified shifts, motion/gait consistency, safe output patterns.

White-collar signals: keystroke/touch dynamics, meeting participation, code diffs, peer-reviewed outputs.

Learning signals: coursework, exams, credentials, research outputs—recorded as signed facts without exposing content. Improvements count relative to personal baselines, not cross-person comparisons.

14 — Participation Layer: Creativity

Original writing, music, visual art, dance, photography, and design are scored for originality on device. Models compute similarity against a person's own history and public baselines to produce O_t in $[0,1]$.

Only proofs and minimal descriptors leave the device; raw media stays local. The system rewards sustained originality rather than one-time spikes or plagiarism.

15 — Participation Layer: Community and Events

Participation in marathons, concerts, meetings, rallies, pilgrimages, festivals, parades, group learning or therapy sessions is recognized through signed attendance.

These events create short-lived surges in community participation scores that apply

broadly to verified attendees within the event window.

The structure encourages real-world social bonds and collective well-being.

16 — Participation Layer: Environment and Urban Design

Verified restoration and stewardship—tree planting, biodiversity projects, pollution cleanup, rewilding, sustainable design, and green architecture—contribute to S_t.

Actions that degrade ecosystems are ineligible. Designs and public spaces that increase diversity and beauty and demonstrably improve well-being are eligible via recognized attestations.

The rule is simple: life-positive environmental actions qualify; harmful actions do not.

17 — Merchants, Governments, Taxes, and Exchange

Merchants can accept Atlas directly or via stable-pair routing; receipts can feed cost-of-living indices in a privacy-preserving way.

Governments can credit taxes for Atlas participation and pay certain benefits in Atlas.

Participants can convert to fiat through partners where allowed.

Atlas remains interoperable and optional, reducing adoption friction.

18 — Interoperability and Local Denominations

Atlas is the global anchor. Nations and communities may define denominations pegged to Atlas (e.g., 1 Atlas = 1000 Local-Cents) for local pricing and policy.

Micro-denominations (neighborhoods, schools, gaming groups) are allowed if they settle upward to Atlas, respect privacy and harm-exclusion, and publish conversion openly.

This maintains a single global value fabric with local spendability and experimentation.

19 — Security Model and Threat Mitigations

Sybil/bot farms are deterred by liveness checks and secure device binding. Sensor spoofing and GPS faking are countered by cross-sensor consistency checks and randomized challenges,

with trust weights reduced for suspicious epochs. Collusive attestations are mitigated through issuer reputation, audits, and slashing; whistle-blower bounties apply.

Privacy attacks are limited by zero-knowledge proofs and strict local processing. Validator corruption is deterred by slashing, committee rotation, and public audits.

Oracle manipulation is reduced by diverse sources, robust aggregation, and community challenge processes.

20 — Harmless Gaming vs Abuse

Atlas permits harmless “gaming” that produces real novelty or originality without harm.

The system is explicit about ineligible categories: any action that causes pain, suffering,

disease, death, or environmental damage.

Attempts to simulate signals without real activity are penalized by cross-sensor checks, unpredictable prompts, and degraded trust weights. The objective is to redirect competitive energy into safe, beneficial novelty creation.

21 — Governance and Constitutional Articles

Bicameral governance: Commons (one-person-one-vote, liveness-gated, privacy-preserving tally) and Stewards (elected technical council). Commons decides constitutional questions and elects Stewards.

Stewards tune parameters ($\alpha, \epsilon, \kappa, \lambda$), audit code, manage emergency patches with automatic sunset, and maintain security processes.

Constitutional changes require supermajorities, time-locks, and full public logs of deliberations and code diffs.

22 — Smartphone MVP: Step-by-Step Build Plan

Phase 1 (2 weeks): capture motion/GPS/interaction windows; implement on-device feature extraction; rolling baseline; prototype scoring; commit-hash pipeline.

Phase 2 (2 weeks): add zero-knowledge threshold proofs; PoL liveness prompts; device attestation; simple wallet; testnet validators verifying proofs.

Phase 3 (2–4 weeks): attestation registry for providers/employers/schools/organizers; cost-of-living oracles; merchant API with stable-pair routing; reports and audits.

Phase 4 (ongoing): pilots with volunteers; parameter tuning; open-source SDKs; independent audits and red-team testing.

23 — Reference Algorithms (Pseudocode)

Baseline estimation (rolling median + MAD):

$H0_k = \text{median}_{\{t \in W\}}(\text{metric}_k(t))$; $\text{scale}_k = 1.4826 \cdot \text{median}_{\{t \in W\}}|\text{metric}_k(t) - H0_k|$.

Normalization: $z_k(t) = (\text{metric}_k(t) - H0_k) / (\text{scale}_k + \epsilon)$.

Novelty (JSD): $N_t = \text{JSD}(P_{\text{epoch}} || P_{\text{history}})$.

Originality (on-device embeddings): $O_t = 1 - \max_{\text{sim}}(\text{embedding}(\text{epoch_output}), \text{embeddings}(\text{past_outputs}) \cup \text{public_baseline})$.

Score: $\text{SCORE}_t = \alpha \cdot \text{clip}(\text{mean}_k \max(z_k(t), 0), 0, \kappa) + \beta \cdot N_t + \gamma \cdot O_t + \delta \cdot C_t + \epsilon \cdot S_t$.

Commit: $c_t = H(\text{hash}(\text{inputs}_t || \text{nonce}_t))$. Prove threshold claims with ZK; publish (c_t , proofs, attestations).

24 — Privacy Model and Compliance Posture

All sensitive processing occurs on device. Only commitments, proofs, and minimal attestations are transmitted. Records such as health details are never uploaded. Participants control participation and can pause or exit. Transparency reports and audits are public. Open-source reference implementations enable community inspection. This posture minimizes regulatory friction while maintaining strong privacy guarantees.

25 — UBI Projection Scenarios (Illustrative)

Let P_A be Atlas unit price in local fiat. Monthly UBI per person $U_i = C_i$ (cost of living). System-wide $U_{total} = \sum C_i$. Funding comes from predictable issuance (controlled by λ), donor pools, validator fees, and merchant/government demand. Scenario A (conservative): limited merchant adoption; λ set low; donor buffer funds part of U_{total} while adoption grows. Scenario B (moderate): merchant adoption and tax credits increase demand; λ adjusted to keep inflation predictable; U_{total} fully funded. Scenario C (aggressive): strong adoption; price support rises; variable rewards grow after UBI is secured. These are illustrations; governance adjusts parameters transparently with monthly public accounting.

26 — Fairness, Accessibility, and Disability Inclusion

Scoring is relative to self, not cross-person comparisons. UBI ensures survival regardless of ability or health. Verified therapy, adherence, and safe micro-improvements count. Interfaces are accessible; participation can be passive. People may choose not to participate without penalty beyond foregone rewards. The objective is to recognize progress at every starting point while preserving privacy and dignity.

27 — Ethics, Eligibility, and Harm Exclusion

Ethical guardrails are explicit: any action that causes pain, suffering, disease, death, or environmental damage is ineligible. Eligibility is published, transparent, and enforced via proofs and attestations. Appeals processes allow participants to challenge decisions. The system rewards actions that measurably improve health, knowledge, safety, creativity, cooperation, and environmental quality.

28 — Testing, Audits, and Key Indicators

Security testing includes red-team exercises, fuzzing of proof verifiers, and anomaly detection trials at scale. Key indicators: UBI coverage ratio, adoption growth, health/education participation rates, merchant acceptance, fraud rates, privacy incident count, governance responsiveness, and

user-reported well-being metrics.
Monthly public reports and third-party audits are mandatory.

29 — Pilot and Deployment Playbook

City pilot: recruit volunteers; integrate local providers and event organizers; publish public dashboards.

Campus pilot: focus on learning and creativity layers; integrate exams and hackathons.

Employer pilot: voluntary participation; work and wellness layers; clear firewalls between HR and personal data (only proofs/attestations).

Iterate on parameters and publish open learnings before scaling.

30 — Definitions and Terms

Proof of Entropy (PoE™): reward mechanism measuring life-positive unpredictability with privacy.

Proof of Life (PoL): liveness binding to a living human without centralized biometrics.

Baseline (H_0): rolling background level per person.

SCORE_t: combined per-epoch score from baseline improvement, novelty, originality, community, and environment signals.

UBI_{mint} / VAR_{mint}: issuance tranches; UBI funded first; variable rewards proportional to SCORE.

Denomination: locally defined unit pegged to Atlas.

Attestation: simple signed fact by a recognized issuer; no sensitive records.

Harm-exclusion: categorical ineligibility for actions that cause pain, suffering, disease, death, or environmental damage.

Governance: bicameral on-chain system (Commons and Stewards).

31 — Canonical Enumerated Sources of Life-Positive Entropy (Integrated)

Health signals (sleep, breathing cadence, HRV, steps, routine movement); meeting medical activity targets; therapy attendance; medication adherence; safe training and recovery.

Work signals (blue-collar physical output with safety; white-collar interaction dynamics; meetings; code diffs; peer-reviewed outputs; verified shifts).

Learning signals (coursework, exams, credentials, research outputs as signed facts).

Creativity signals (writing, music, visual art, dance, photography, design; originality computed on device against self history and public baselines).

Community signals (participation in marathons, concerts, meetings, rallies, pilgrimages, festivals, parades, group learning/therapy).

Environment signals (restoration, biodiversity, cleanup, rewilding, sustainable design, green architecture).

Daily life signals (keystroke/touch timing, gait, GPS trajectories, dwell/transition patterns,

conversation timings—processed locally).

Safety rules (harmful actions are ineligible regardless of signal values).

Event surges (mass events create short-lived increases shared by verified attendees).

Device integrity (attested hardware/software; randomized liveness prompts).

Harmless gaming (novelty and originality gains without harm are allowed).

Local experimentation (jurisdictions and communities pilot new attestations subject to constitutional review).

Merchant, government, and donor participation (clear roles, transparency, and audits).

32 — Authorized Analogies (Listed Only)

Atlas carrying the world; mycelium vs trees; short-lived surges for mass events; collaboration compounding effects; crypto puzzles replaced by life-driven entropy; humans as efficient hybrids; post-currency stance; AI as computational bones with humans as living flesh; baseline as background hum; harmless gaming equals innovation; death removes value, life adds value.