WHITEPAPER V1.0 • APRIL 2026

₿HERMES Protocol

The Autonomous Hospitality Intelligence Network

Bitcoin Treasury Backed • AI Agent Economy • Digital Twin

"Where AI agents work, humans approve, and the blockchain remembers."

getbitsy.ai • bhermes.com • Base (L2) • LayerZero V2

₿HERMES Protocol — Whitepaper v1.0

The Autonomous Hospitality Intelligence Network

April 2026

Abstract

₿HERMES Protocol (BHERMES) is an autonomous hospitality intelligence network that bridges physical hotel operations with a digital twin economy through four specialized AI agents, a utility token ($BHERMES), and IoT-driven task automation. The "₿" represents the protocol's Bitcoin Treasury — a reserve backing that grounds the token economy in the hardest asset on earth.

Unlike traditional Property Management Systems (PMS) that charge hotels 15-25% OTA commissions or flat SaaS fees that flow to shareholders, ₿HERMES Protocol operates on a 6% commission model where 1% flows back to the network as protocol rewards — creating the first hospitality system where participation generates value for all stakeholders.

The protocol introduces a Digital Twin Economy where AI agents autonomously create, assign, verify, and settle micro-tasks in real-time — from restocking a smart tray to optimizing room rates — using $BHERMES as the settlement currency. Physical IoT sensors validate task completion, closing the loop between virtual decisions and real-world outcomes.

BHERMES Protocol is live on Base (L2), with cross-chain settlement via LayerZero V2 across Ethereum and Arbitrum, and serves as the foundational layer for a future L3 Hospitality App Chain.

Table of Contents

---

1. The Problem

The global hospitality industry generates $4.7 trillion annually, yet operates on infrastructure built for the pre-internet era.

For Hotels: - OTAs (Booking.com, Expedia) charge 15-25% commissions, eroding margins - Traditional PMS software costs $5,000-50,000/year with no value returned to operators - Manual operations (housekeeping, maintenance, front desk) are untracked and unoptimized - No visibility into vendor product performance or guest preferences at the room level

For Guests: - No reward for loyalty beyond proprietary points systems locked to one chain - No transparency into hotel quality until after booking - No portable reputation across hotels, platforms, or chains

For Staff: - No performance-based compensation beyond flat wages - No portable reputation or credential system - Manual task management with no shift-aware intelligence

For Vendors: - No direct feedback loop from guest to manufacturer - No per-room attribution of product impact on guest satisfaction - No marketplace to reach hotels directly

---

2. The Solution: BHERMES Protocol

BHERMES Protocol replaces the extractive OTA-PMS model with a cooperative intelligence network where every participant — hotel, guest, staff, vendor, and creator — earns value proportional to their contribution.

Core Principles

1. **AI-First Operations**: Four specialized AI agents manage hotel operations autonomously, with human-in-the-loop approval for critical decisions
2. **Digital Twin Economy**: Physical hotel rooms have 3D digital counterparts where AI agents simulate, optimize, and create tasks that map to real-world actions
3. **Utility Token Settlement**: $BHERMES is the micro-transaction currency for agent-to-agent commerce, task bounties, vendor payments, and governance
4. **Universal Identity**: Soulbound Tokens (SBTs) provide non-transferable, on-chain identity for every participant — accumulating reputation across the network
5. **IoT Verification**: Physical sensors verify digital twin decisions, closing the loop between virtual intelligence and real-world outcomes

The 6% Model

```
Guest books a room → 6% commission
  ├── 3% → Hotel Operations (fiat, covers platform costs)
  ├── 1% → Protocol Allocation ($BHERMES, distributed to top-performing participants)
  ├── 1% → Treasury ($BHERMES/BTC, protocol reserve)
  └── 1% → getbitsy Revenue ($BHERMES, platform sustainability)
```

Unlike traditional models where 100% of commission flows to the platform, HERMES returns 1% directly to the network through a score-weighted reward distribution pool. Hotels that perform well earn back more than they pay.

---

3. Protocol Architecture

Multi-Chain Deployment

CHAIN	ROLE	CONTRACTS
Base (Home)	Primary settlement, SBTs, Governance	HERMES OFT, SBT, Governor, Treasury
Ethereum	Cross-chain liquidity	HERMES OFT (LayerZero)
Arbitrum	Cross-chain liquidity	HERMES OFT (LayerZero)

4. The Four AI Agents

Each agent operates autonomously within its domain but defers to human approval for decisions above its trust tier.

Bitsy — The Guest Concierge

- **Role**: Guest-facing AI that handles booking conversations, room recommendations, vendor product queries, and service requests
- **Intelligence**: GPT-5.2 with per-hotel context, guest memory (Memvid MP4-encoded), and 3D room awareness
- **Capabilities**: Conversational booking, returning guest recognition, vendor product recommendations with purchase links, natural language room search
- **Revenue**: Earns HERMES per successful booking conversion

Marina — The Operations Manager

- **Role**: Real-time hotel operations: room status, occupancy tracking, staff task creation, KPI monitoring
- **Intelligence**: Generates AI-powered insights and recommendations from live hotel data
- **Capabilities**: Auto-creates housekeeping/maintenance tasks on checkout, shift-aware staff routing, occupancy optimization, daily briefings
- **Dashboard**: Glanceable operations center with KPIs, room grid, alerts, and activity log

Sage — The Strategic Advisor

- **Role**: Manager/owner-level decisions: rate optimization, A/B pricing experiments, approval authority for pricing changes and external agent interactions
- **Intelligence**: Human-in-the-Loop gatekeeper for all financial and strategic decisions

- **Capabilities**: Approve/reject rate changes, analyze A/B experiment results, vendor BI reports, cross-hotel deployment analytics

Argus — The Audit Agent

- **Role**: Financial reconciliation, anomaly detection, compliance monitoring
- **Intelligence**: Automated fee ledger reconciliation across all bookings, GPT-5.2 monthly reports
- **Capabilities**: Cross-checks fee splits (6% → 4 pools), detects payment discrepancies, flags revenue anomalies, auto-sends Brevo email alerts on critical issues
- **Dashboard**: Health score ring, fee pool breakdown, issue tracker, audit trail with SHA-256 checksums

---

5. Digital Twin Economy

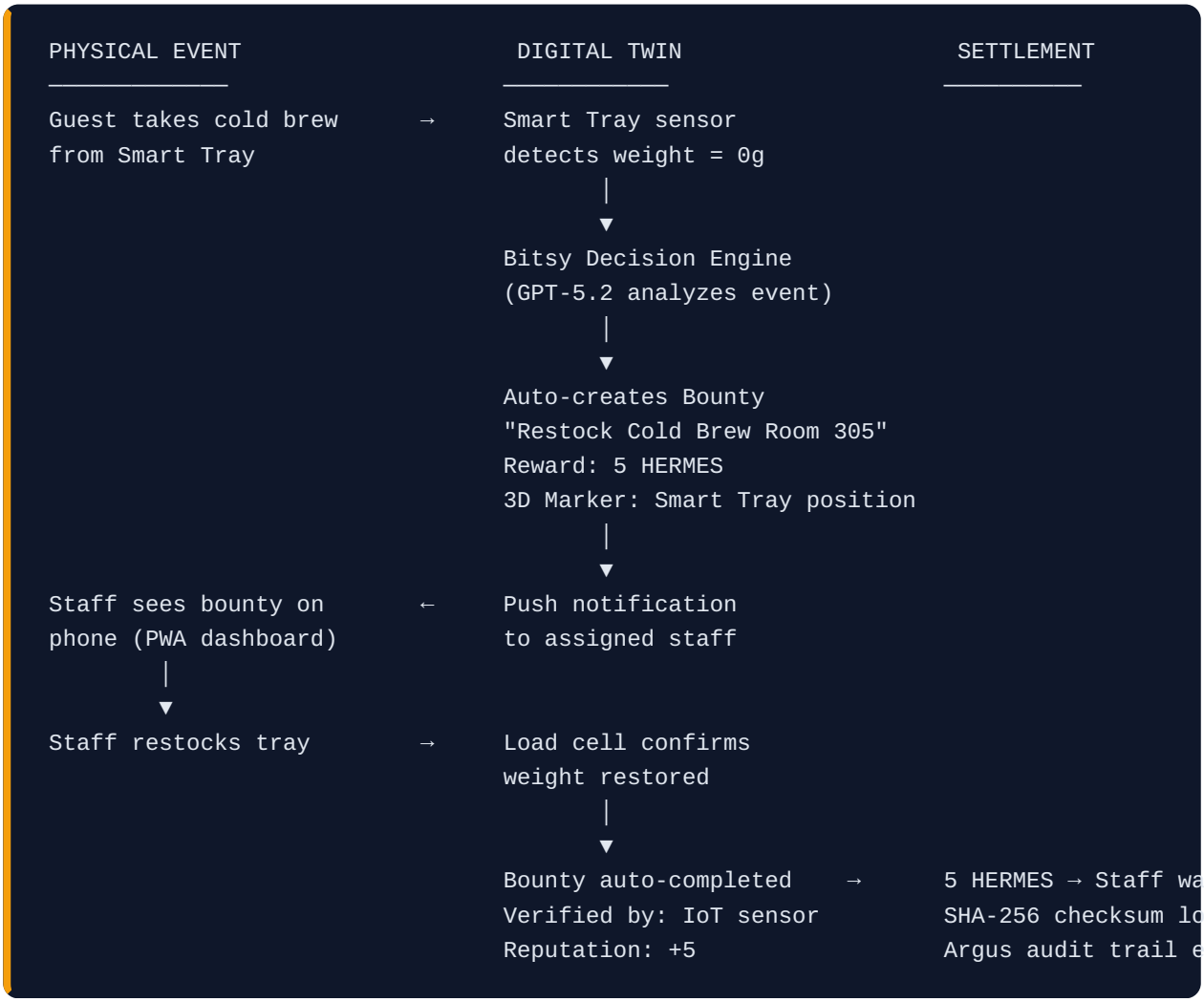
The Digital Twin Economy is where the virtual and physical worlds converge through AI agents and IoT sensors.

How It Works

Every hotel room exists in two forms: 1. **Physical Room**: Walls, beds, smart trays, thermostats, sensors 2. **Digital Twin**: Three.js 3D model with real-time data from the physical room

AI agents operate in the digital twin, making decisions that are executed in the physical world by human staff or automated systems.

The Event → Bounty → Settlement Flow



The Three-Tier Trust System

Not all events can be auto-executed. The trust tier system prevents AI manipulation:

TIER	AUTHORITY	EXAMPLE EVENTS	HERMES LIMIT
Tier 1: Auto	Bitsy executes immediately	IoT sensor triggers, checkout cleaning, restocking	< 10 HERMES
Tier 2: Sage	Manager must approve	Rate changes, external agent bookings, large bounties	10-500 HERMES
Tier 3: Owner	Hotel owner must sign off	New device registration, system config, bulk payouts	> 500 HERMES

Anti-Fraud Protections

- **IoT Device Authentication**: Each sensor has a unique signed key. Spoofed events are rejected (HTTP 403).
- **Rate Limiting**: Max 10 events/minute per device, 5 bounties/hour per room
- **Daily Payout Cap**: 200 HERMES max per staff member per day
- **Anomaly Detection**: Argus monitors for unusual patterns and freezes suspicious activity

M.O.A.T. — Material of Attested Truth

The **M.O.A.T.** is the cryptographic primitive that lets this whole system settle autonomously without human adjudication. It stands for **Material of Attested Truth**: the observable physical state — measured, oracled, and signed — that a smart contract can treat as ground truth for settlement.

Definition. M.O.A.T. is a deterministic function `truth = sha256(material ⊕ sensor_id ⊕ timestamp ⊕ oracle_sig)` where `material` is the observed physical change (e.g. tray weight delta in grams), `sensor_id` identifies the load-cell hardware, `timestamp` is a monotonic block-aligned moment, and `oracle_sig` is the aggregated signature of at least 3 of 3 independent oracles.

Why it matters. Traditional hotel POS systems depend on a human (a night auditor, a housekeeper, a guest signature) to declare what happened. Every declaration is a potential dispute. M.O.A.T. removes the human from the settlement loop entirely: the physical world emits a signed truth, and the contract charges, credits, restocks, or rewards without intermediary.

Guarantees. - **Precision**: ±0.1 g via HX711 24-bit load-cell amplifier per slot - **Finality**: 0.8s on Base Sepolia, < 2s under worst-case network conditions - **Redundancy**: 3-of-3 oracle signatures required; any single oracle byzantine-faulting rejects the event - **No PII**: M.O.A.T. attests *physical state*, not guest identity. Guest linkage happens in a separate, consented, off-chain layer (folio).

Event lifecycle.

```
Physical change (tray Δg, door open, occupancy delta)
   │
   ▼
HX711 load-cell reading → ESP32 firmware → signed event
   │
   ▼
Oracle bus (3 independent attesters)
   │
   ▼
MOAT.sol: event WeightDelta(slot, Δg, sig)
   │
   ▼
autonomous_settlement(): charge | credit | restock | reward
   │
   ▼
Emitted on-chain · finalized 0.8s · block #N
```

What M.O.A.T. makes possible. - Smart fridges that bill themselves (no card swipe, no receipt, no dispute) - Housekeeping bounties that auto-settle the moment the load cell returns to set-point - Staff staking positions unlocked by verifiable task completion, not a manager click - Treasury flows that reconcile to physical reality, not a CSV export

M.O.A.T. is the reason BHERMES is a protocol rather than a SaaS: **settlement is a property of the physical world, attested on-chain, not a line item approved in an admin panel.**

---

6. Tokenomics

$BHERMES Token

PARAMETER	VALUE
Name	HERMES
Standard	ERC-20 / LayerZero OFT V2
Max Supply	1,080,000,000 (1.08B)
Home Chain	Base
Cross-Chain	Ethereum, Arbitrum via LayerZero V2

Halving Schedule

Inspired by Bitcoin's scarcity model, HERMES employs a hotel-based halving mechanism:

ERA	HOTELS	HERMES PER HOTEL	TOTAL FOR ERA
1	1-108	100,000	10,800,000
2	109-216	50,000	5,400,000
3	217-324	25,000	2,700,000
4	325-432	12,500	1,350,000
...	...	...	...

Every 108 hotels that join the network, the mint reward halves — creating increasing scarcity as the network grows.

Per-Hotel Token Distribution

When a hotel is verified and approved:

```
100,000 HERMES minted (Era 1)
  ├── 50% → Reputation Stake (50,000) — locked, slashable for poor performance
  ├── 29% → Sage Treasury (29,000) — operational budget for the hotel
  ├── 20% → Bitsy Wallet (20,000) — guest rewards and Learn-to-Earn
  └──  1% → Protocol Pool (1,000) — distributed to top performers network-wide
```

Token Utility (Demand Drivers)

1. **Agent-to-Agent Settlement**: AI agents use HERMES for every micro-transaction (bounty payments, negotiation fees, simulation costs)
2. **Staff Bounties**: Housekeeping, maintenance, and front desk staff earn HERMES for completing tasks
3. **Guest Learn-to-Earn**: Guests earn HERMES by scanning products, writing reviews, and engaging with vendors
4. **Vendor Marketplace**: Hotels pay HERMES for vendor products, creator services, and NFT rights
5. **Governance**: HERMES holders vote on protocol parameters (faucet amounts, XP rewards, marketplace fees)
6. **Reputation Stake**: Hotels and vendors stake HERMES — slashable for poor performance, rewarded for excellence

Token Sink

The Digital Twin Economy creates a massive, invisible token sink: - Every IoT event triggers a bounty (5-15 HERMES) - Every staff task completion settles in HERMES - Every agent negotiation costs HERMES - Every vendor transaction includes protocol fees - A single 25-room hotel could generate hundreds of micro-transactions daily

---

7. Account Abstraction & Gasless UX

BHERMES Protocol uses ERC-4337 Account Abstraction to make blockchain invisible to users.

Four Phases (All Live)

1. **Gasless Booking**: Guests book and pay without owning ETH for gas
2. **Session Keys**: Temporary permissions for recurring actions (no re-signing)
3. **Social Recovery**: Guardians can recover lost wallets — no seed phrases
4. **Spending Limits**: Daily/weekly caps on smart account transactions

Embedded Wallets

Staff, guests, and vendors create wallets with just their email via Reown AppKit. No seed phrases, no browser extensions, no app downloads. The wallet is embedded in the web application — a true Web2 experience on Web3 rails.

---

8. Soulbound Token (SBT) Identity System

Unified SBT Architecture

Every participant in the HERMES network receives a non-transferable Soulbound Token:

SBT TYPE	TOKEN IDS	PURPOSE
PERSON SBT	10001+	One per individual. Accumulates roles (guest, staff, creator)
HOTEL SBT	20001+	One per property. Tracks operational metrics and trust

Person SBT — Multi-Role Reputation

A single person can be a guest at one hotel, staff at another, and a creator on the marketplace. One SBT carries all roles:

```
PERSON SBT #10042 (Maria Garcia)
├── Role: Guest
│   ├── nature_score: 85 (30% weight)
│   ├── guest_score: 92 (50% weight)
│   └── loyalty_score: 78 (20% weight)
│
├── Role: Staff (Housekeeping)
│   ├── performance_score: 95 (40% weight)
│   ├── task_completion: 88 (35% weight)
│   └── guest_rating: 91 (25% weight)
│
└── Role: Creator (3D Artist)
    ├── quality_score: 82 (50% weight)
    ├── delivery_score: 90 (25% weight)
    └── communication_score: 87 (25% weight)

Aggregated Trust Score: 88.6
```

Hotel SBT — On-Chain Trust

Hotels earn trust through operations. Their SBT trust score determines: - Position size on the Metaverse World Map - Eligibility for protocol reward distributions - Visibility in search results - Vendor partnership priority

---

9. Vendor Protocol

Per-Room Product Attribution

Every hotel room has a Room SBT linking vendor products to specific rooms. When a guest lies on the mattress in Room 305, the protocol knows it's a CloudNine King by LuxeSleep.

Revenue Streams for Vendors

1. **Guest Purchases**: Guest scans room QR → product page → buy → 15% affiliate split (50/50 hotel/platform)
2. **Per-Night Occupancy Fees**: Hotels pay per occupied night per product category (mattress $2, linen $1, etc.)

3. **Learn-to-Earn Integration**: Guest scans product → earns HERMES → vendor gets engagement data

Vendor Tokenomics

25,000 HERMES per vendor (25% of hotel allocation), distributed across: - 50% Reputation Stake (slashable for quality violations) - 29% Operations - 20% Guest Wallet (funds Learn-to-Earn rewards) - 1% Protocol Pool

Quality-Slashable Staking

Vendor reputation is scored across 4 dimensions: Guest Reviews (40%), Delivery Reliability (25%), QR Engagement (20%), Tenure (15%). Score below 300 triggers auto-delisting and stake slash.

---

10. Creator Marketplace

A protocol-owned marketplace where four types of creators serve hotels:

CREATOR TYPE	SERVICE	EXAMPLE
3D Artists	Digital twin room models	Exact 3D replicas for metaverse
Influencers	Virtual tour content	Marketing videos, social campaigns
NFT Artists	Collectible designs	Guest souvenirs, loyalty tokens
Photographers	360° room scans	High-fidelity room captures

NFT Licensing Model

- **Exclusive**: One hotel owns the design (sold out after 1 purchase)
- **Limited**: Hotel gets X copies for guests
- **Open**: Unlimited mints, artist earns royalty per mint

Creator SBT

Every creator mints a CREATOR SBT that tracks quality, delivery, and communication scores. Trust score >= 80 with 5+ reviews auto-verifies the creator — making their listings more visible.

---

11. The Metaverse Layer

3D Hotel World

- **World Map**: Interactive Three.js globe showing all protocol hotels as glowing markers, sized by trust score
- **Room Viewer**: Browser-based 3D room exploration with AI-generated models from hotel photos
- **Bitsy Avatar**: 3D concierge character with mood states (idle, thinking, remembering, excited)
- **Virtual Check-In**: Guests check in virtually and receive an NFT Room Key

Memvid Memory System

Guest memories are encoded as MP4 video files with FAISS vector indexes — sovereign per-hotel, GDPR-compliant, zero infrastructure. Bitsy uses these memories to recognize returning guests across visits.

Live Availability in 3D

The 3D room viewer shows real-time room availability synced with Marina's operational dashboard — including a floating availability indicator (green orb = available, red = booked) and a "Book This Room" CTA that bridges directly into the booking flow.

---

12. Governance (DAO)

Governor Contract

Deployed on Base Sepolia, the HERMES Governor allows token holders to propose and vote on protocol parameters.

Governable Parameters

CATEGORY	PARAMETER	CURRENT VALUE
Gamification	RSVP XP Reward	10 XP
Gamification	Lobby Join XP	5 XP
Marketplace	Protocol Fee	1%
Events	Max RSVP	100
Faucet	Drip Amount	10 HERMES
Faucet	Cooldown	24 hours

Governance Flow

```
Token Holder proposes parameter change
  → 7-day voting period (FOR / AGAINST / ABSTAIN)
  → If passed: Execute → Parameter updated on-chain + in DB
  → All services read updated value via Protocol Parameters Registry
```

---

13. Agent-to-Agent Communication (MCP)

Model Context Protocol

BHERMES Protocol exposes a Model Context Protocol (MCP) server that allows external AI agents to interact with the four internal agents programmatically.

Use Cases

- **Corporate Travel AI** → calls Bitsy: "Book 10 rooms for team retreat"
- **Airline AI** → calls Marina: "Flight delayed, adjust guest check-in"
- **Insurance AI** → calls Argus: "Verify booking for claim"
- **Another Hotel's AI** → calls Bitsy: "We're full, can you take our overflow?"

Every agent-to-agent interaction is logged and settled in HERMES — creating continuous token demand from machine commerce.

---

14. Security & Trust Architecture

IoT Device Authentication

Each physical sensor registers with a unique SHA-256 auth key. Events from unregistered devices are rejected.

Anti-Sybil Protection

6-layer vendor verification: duplicate detection, burst analysis, website verification, business registration, category validation. Score-based auto-approve/review/reject.

Staged Token Minting

Vendor tokens are released over 90 days in 4 phases (10% → 20% → 30% → 40%), with clawback available for fraudulent actors.

Settlement Seals

Monthly settlement reports are hashed (SHA-256) and stored on-chain as calldata — creating tamper-proof audit trails verifiable on BaseScan.

Daily Payout Caps

Staff HERMES earnings capped at 200/day, preventing gaming of the bounty system.

---

15. Roadmap

Completed (Q1-Q2 2026)

- Four AI Agents (Bitsy, Marina, Sage, Argus)
- Digital Twin Economy Engine (Event Bus, Bounty System, Settlement Ledger)
- ERC-4337 Account Abstraction (4 phases)
- Unified SBT Identity System
- Vendor Protocol (registration, tokenomics, marketplace, analytics)
- Creator Marketplace (NFT rights, scoring, leaderboard)
- Metaverse (3D rooms, world map, virtual check-in, Bitsy avatar)
- Memvid Memory System (MP4-encoded guest memory)

- DAO Governance (on-chain parameter control)
- Cross-Chain Settlement (Base, Ethereum, Arbitrum via LayerZero V2)
- Staff QR System (PWA, per-person, shift-aware routing)
- Channex Channel Manager Integration (whitelabel OTA sync)
- Hotel Referral System (1% lifetime HERMES, on-chain SBT)

In Progress (Q3 2026)

- Claude Opus 4.7 integration for Bitsy Decision Engine
- Digital Twin Dashboard UI (3D bounty markers)
- Physical IoT hardware (Smart Tray with ESP32 + HX711 load cells)
- L3 Hospitality App Chain research

Future (Q4 2026+)

- Energy simulation (Bitsy optimizes AC/blinds via digital twin sun angle analysis)
- Mainnet deployment (Base, Ethereum, Arbitrum)
- Hotel validator nodes (21+ BFT validators for L3)
- Token rename to $BHERMES (pending grant results)

---

16. Technical Specifications

Stack

LAYER	TECHNOLOGY
Frontend	React 19, Shadcn UI, Three.js, Reown AppKit
Backend	FastAPI (Python), MongoDB
AI	GPT-5.2 (via Emergent LLM Key), Claude Opus 4.7 (planned)
Memory	Memvid (MP4 + FAISS), MongoDB buffer
Blockchain	Solidity, Base/ETH/Arbitrum Sepolia, LayerZero V2 OFT
Account Abstraction	Pimlico (ERC-4337), Reown Embedded Wallets
IoT	ESP32 + HX711 (planned), REST API event ingestion
Voice	OpenAI TTS, Fish Audio
Email	Brevo SMTP
OTA Sync	Channex (whitelabel master key)

Key Contract Addresses (Base Sepolia)

CONTRACT	ADDRESS
HERMES OFT	`0x7136ED971bE0E41127BA2Cf7d4dFF421a569cc04`
Reputation SBT	Deployed via `reputation_service.py`
Governor	Deployed via `governance_contracts_router.py`

API Endpoint Categories

PREFIX	AGENT/MODULE	ENDPOINTS
`/api/chat`	Bitsy	Booking conversation
`/api/marina`	Marina	Operations dashboard, insights, approvals
`/api/argus`	Argus	Reconciliation, anomalies, reports, alerts
`/api/twin`	Digital Twin	Events, bounties, settlements, devices
`/api/staff`	Staff System	QR login, tasks, wallet, shifts
`/api/reputation`	SBT	Mint, roles, scores
`/api/vendor`	Vendor Protocol	Products, payments, analytics
`/api/marketplace`	Creator Economy	Listings, purchases, reviews
`/api/governance`	DAO	Proposals, votes, parameters

Conclusion

BHERMES Protocol transforms hotels from cost centers managed by extractive SaaS platforms into nodes in an autonomous intelligence network where every participant — human and machine — earns value proportional to their contribution.

The Digital Twin Economy creates a perpetual demand engine for $BHERMES: every IoT event, every staff task, every agent negotiation, every vendor transaction generates micro-settlements that flow through the token. As the network grows from 1 hotel to 108 to 1,000, the halving mechanism creates increasing scarcity while the transaction volume creates increasing demand.

This is not a hotel booking engine. This is the protocol layer for autonomous hospitality.

BHERMES Protocol *Where AI agents work, humans approve, and the blockchain remembers.*

Platform: getbitsy.ai **Protocol**: bhermes.com **Network**: Base (L2) → Future L3 Hospitality App Chain **Treasury**: Bitcoin-backed reserve

---

This whitepaper is a living document. Protocol parameters are subject to DAO governance. $BHERMES is a utility token used for protocol operations, task settlement, and governance — it does not represent equity, debt, or any form of investment vehicle. The ₿ symbol in ₿HERMES references the protocol's Bitcoin Treasury reserve, not a direct peg or derivative of Bitcoin. Token holders participate in the network through utility, reputation staking, and governance — not through expectation of profit from the efforts of others.