RealmOS — The Physical API for AI Agents

The API Layer That Lets AI Agents Touch the Real World

Executive Summary

RealmOS is the infrastructure layer that bridges the gap between digital AI agents and physical reality. It's Twilio for atoms—a unified API that enables any AI agent to perceive, interact with, and control the physical world through a global network of sensors, actuators, drones, robots, and smart devices.

AI agents can now browse the web, write code, and manage calendars. But they can't open a door, inspect a roof, move a package, or adjust a thermostat. RealmOS solves this by providing a **standardized physical actions API** that abstracts away the complexity of hardware, connectivity, and robotics.

Category: Infrastructure / Robotics / AI Agent Platform
Target Market: $847B Global IoT + $500B Robotics + $200B+ AI Agent Economy
Revenue Model: API Usage Fees + Network Access Fees + Enterprise Platform
Funding Target: $25M Series A
Projected ARR (Year 3): $320M

The Problem

AI Agents Are Trapped in the Digital World

1. **The Physical Bottleneck**: GPT-5, Claude, Gemini—these agents can reason, plan, and execute complex tasks digitally. But the moment a task requires physical interaction (inspect equipment, move inventory, check on a location), they hit a wall
2. **Fragmented Hardware Ecosystem**: Millions of robots, drones, sensors, and IoT devices exist—but no unified way to access them. Each has proprietary APIs, protocols, and access controls
3. **Complexity Barrier**: Even sophisticated enterprises can't easily let AI agents control physical systems. The integration work is massive: security, reliability, hardware abstraction, error handling
4. **Untapped Capacity**: Industrial robots sit idle 40% of the time. Delivery drones are underutilized. Security cameras generate data no one analyzes. There's massive physical infrastructure with no unified access layer
5. **The Missing "Twilio Moment"**: Before Twilio, adding phone capabilities to software required telecom expertise, hardware, and carrier relationships. Twilio abstracted it to an API call. No equivalent exists for physical actions

The Numbers Tell the Story

- **$847B** global IoT market by 2028
- **$500B** robotics market by 2030
- **95%** of IoT data goes unanalyzed
- **40%+** industrial robot idle time
- **0** unified APIs for AI-to-physical interaction
- **$200B+** projected AI agent economy by 2028
- **100M+** AI agents expected to be deployed by 2027

The Solution

RealmOS: The Physical World's API Layer

RealmOS provides a unified API that enables any AI agent to execute physical actions through a distributed network of devices, with built-in verification, safety, and reliability.

```python
# Example: AI agent inspects a warehouse
from realmos import RealmClient

realm = RealmClient(api_key="rk_live_...")

# Request a drone inspection
inspection = realm.actions.create(
    type="visual_inspection",
    location={"lat": 37.7749, "lng": -122.4194, "site": "warehouse-12"},
    targets=["inventory_shelves", "loading_dock", "roof"],
    capture=["photo", "thermal", "video_30s"],
    analysis=["damage_detection", "inventory_count", "anomaly_scan"]
)

# AI receives structured results within minutes
results = realm.actions.wait(inspection.id)
print(results.findings)  # {"inventory_delta": -12, "anomalies": [...]}
```

Core Platform Components **1. Universal Physical Actions API** - **Perception Actions**: See, hear, sense temperature/humidity/vibration - **Manipulation Actions**: Move, pick, place, assemble, adjust - **Locomotion Actions**: Navigate, patrol, follow, position - **Communication Actions**: Display, announce, signal, alert - **Environmental Actions**: Adjust HVAC, lighting, access controls

2. RealmOS Network - Distributed network of enrolled hardware partners - Drones, robots, IoT hubs, smart buildings, vehicles - Geographic coverage with SLA guarantees - Real-time availability and capability mapping

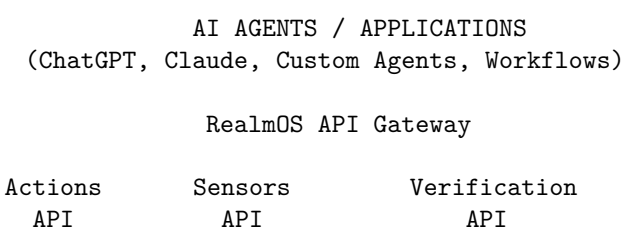
3. Hardware Abstraction Layer - Unified interface regardless of device manufacturer - Automatic capability matching (need a camera? We find one) - Graceful degradation and redundancy - Quality-of-service guarantees

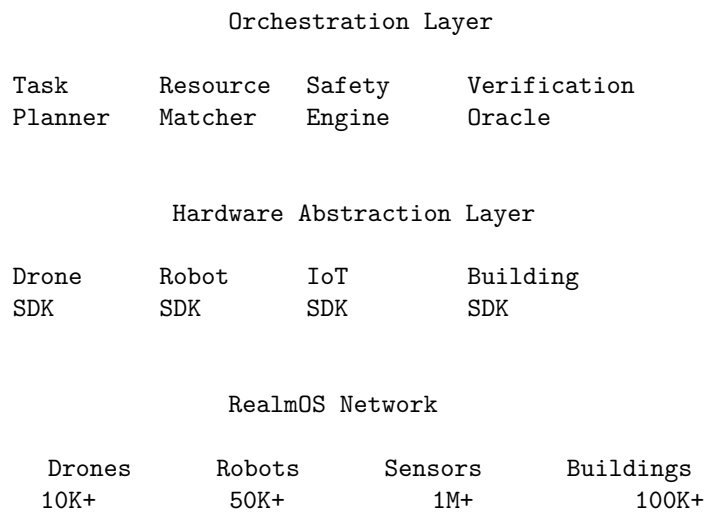
4. Verification Engine - Cryptographic proof of physical execution - Multi-sensor confirmation - Tamper-evident action logs - Chain-of-custody for sensitive operations

5. Safety & Governance Layer - Human-in-the-loop for sensitive actions - Geofencing and no-go zones - Rate limiting and anomaly detection - Compliance frameworks (OSHA, FAA, industry-specific)

Technology Architecture

The RealmOS Stack





Key Technical Innovations

1. Semantic Action Language (SAL) - High-level intent expression ("check if the door is locked") - Automatic decomposition into hardware-specific commands - Learning from execution to improve future planning

2. Physical World Model - Continuously updated digital twin of accessible locations - Predictive availability and cost modeling - Historical action success rates by location/type

3. Cryptographic Verification Protocol - Zero-knowledge proofs of physical execution - Sensor fusion for tamper resistance - Blockchain-anchored audit trail

4. Federated Control Mesh - Latency-optimized routing to nearest capable device - Automatic failover and redundancy - Edge compute for real-time operations

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Use Cases & Market Applications

1. Enterprise Operations ($80B TAM)

Facilities Management

```
# AI facility manager performs nightly security sweep
realm.actions.create(
    type="patrol",
    route="perimeter_plus_interior",
    capture=["video", "thermal"],
    triggers=["motion", "door_ajar", "temperature_anomaly"],
    schedule="nightly_2300"
)
```

Equipment Inspection - AI maintenance agents dispatch drones to inspect HVAC, rooftops, equipment - Predictive maintenance with physical verification - 80% reduction in manual inspection costs

2. Logistics & Supply Chain ($120B TAM)

Last-Mile Delivery Orchestration

```
# AI logistics agent dispatches delivery
realm.actions.create(
    type="deliver",
    package_id="PKG-12345",
    destination={"address": "123 Main St", "instructions": "Leave at door"},
    constraints={"time_window": "14:00-16:00", "photo_proof": True}
)
```

Warehouse Operations - Inventory verification without manual counts - Autonomous restocking and organization - Cross-dock optimization with physical execution

3. Insurance & Risk ($60B TAM)

Claims Verification

```
# AI claims adjuster dispatches inspection
realm.actions.create(
    type="damage_assessment",
    location=claim.property_address,
    capture=["aerial_photo", "ground_photo", "measurements"],
    compare_to="pre_loss_baseline",
    output="structured_damage_report"
)
```

Underwriting - Pre-policy property inspections at scale - Continuous risk monitoring - Instant catastrophe damage assessment

4. Agriculture ($25B TAM)

Crop Monitoring

```
# AI agronomist monitors field health
realm.actions.create(
    type="agricultural_survey",
    field_id="north_40",
    capture=["multispectral", "NDVI", "thermal"],
    analysis=["pest_detection", "irrigation_needs", "yield_forecast"]
)
```

5. Construction & Real Estate ($40B TAM)

Progress Monitoring - Daily site surveys with photogrammetric mapping - Automated progress vs. plan comparison - Safety compliance verification

Property Inspection - Pre-sale inspections on demand - Rental turnover verification - Ongoing property monitoring

6. Energy & Utilities ($35B TAM)

Infrastructure Inspection - Power line and pipeline surveys - Solar panel efficiency monitoring - Wind turbine blade inspection

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Business Model

Revenue Streams

1. API Usage Fees (60% of revenue) | Action Type | Price Range | |————|————-| | Visual Inspection (basic) | $2-10 per action | | Drone Survey (standard) | $25-100 per mission | | Manipulation (pick/place) | $5-50 per action | | Environmental Control | $0.10-1 per action | | Continuous Monitoring | $50-500/month |

2. Network Access Fees (25% of revenue) - Hardware partners pay to be listed in network - Revenue share on actions executed - Premium placement and priority routing

3. Enterprise Platform (15% of revenue) - Self-hosted deployment for sensitive operations - Custom safety policies and compliance - Dedicated device pools - Starting at $50K/month

Unit Economics

- **Gross Margin**: 65-75% (after hardware partner revenue share)
- **LTV/CAC**: 8:1 (enterprise), 4:1 (SMB)
- **Net Revenue Retention**: 150%+ (usage grows with adoption)
- **Payback Period**: 6 months

Financial Projections

Metric	Year 1	Year 2	Year 3
API Calls (M)	5	50	300
Revenue	$8M	$65M	$320M
Gross Profit	$5M	$45M	$225M
Network Devices	10K	100K	500K
Enterprise Customers	50	300	1,200

Competitive Landscape

Current Market State

Player	Approach	Limitation
AWS IoT	Device management	No unified action API, no network
DroneDeploy	Drone software	Single modality, no agent integration
Boston Dynamics	Premium robots	Proprietary, not API-accessible
Viam	Robotics SDK	Developer tool, no network effect
Various RaaS	Robots-as-a-Service	Fragmented, vertical-specific

RealmOS Differentiation

1. **Unified API**: One interface for all physical actions
2. **Network Effect**: Growing pool of available devices
3. **AI-Native**: Built for agent-to-physical interaction
4. **Verification**: Cryptographic proof of execution
5. **Horizontal**: Works across every industry

Moats

- **Network Effects**: More devices → better coverage → more agents → more devices
- **Data Flywheel**: Every action improves capability matching and planning
- **Integration Depth**: Enterprise deployments create switching costs
- **Hardware Partnerships**: Exclusive preferred provider agreements

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Go-to-Market Strategy

Phase 1: Foundation (Months 1-6)

Target: Technology-forward enterprises in facilities & logistics

Actions: - Partner with 3-5 drone/robot companies for initial network - Launch in 3 metro areas (SF, NYC, Dallas) - 10 design partners for product-market fit - Focus on inspection use cases (highest value, lowest risk)

Phase 2: Expansion (Months 7-18)

Target: Mid-market facilities, logistics companies, insurers

Actions: - Expand to 25 metro areas - Launch self-serve API tier - Add manipulation capabilities (robots) - Build AI agent partnerships (OpenAI, Anthropic, others)

Phase 3: Scale (Months 19-36)

Target: Global enterprises, government, mass market

Actions: - International expansion (EU, APAC) - Launch enterprise platform (self-hosted) - Consumer-facing capabilities via partner agents - IPO preparation

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Team Requirements

Founding Team Needs

CEO: Enterprise infrastructure background, API-first mindset **CTO**: Robotics + distributed systems (ex-Boston Dynamics, Aurora, Cruise) **VP Engineering**: Platform/API experience (ex-Twilio, Stripe, Plaid) **VP Operations**: Network operations + hardware partnerships **VP Sales**: Enterprise infrastructure sales (IoT/robotics)

Key Hires (Year 1)

- Robotics engineers (5)
- Platform engineers (8)
- Developer relations (3)
- Enterprise sales (5)
- Operations/support (4)
- Hardware partnerships (3)

Investment & Milestones

Series A: $25M

Use of Funds: - Engineering (50%): Core platform + network infrastructure - Operations (20%): Network buildout + partnerships - Sales & Marketing (20%): Enterprise go-to-market - G&A (10%): Legal, compliance, facilities

18-Month Milestones: - [ ] 100K enrolled devices across network - [ ] 50M API calls processed - [ ] $15M ARR - [ ] 150 enterprise customers - [ ] 10 metro area coverage - [ ] Series B raise at $200M+ valuation

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Risk Factors & Mitigation

Risk	Mitigation
Hardware partner dependence	Multi-partner strategy, owned reference hardware
Regulatory (drones, robots)	Proactive FAA/OSHA engagement, compliance-first
Safety incidents	Comprehensive insurance, safety-first culture
Enterprise sales cycle	Product-led growth for SMB, land-and-expand
Competition from hyperscalers	Speed, specialization, network effects

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Why Now?

Convergence of Forces

1. **AI Agent Explosion**: GPT-4/5, Claude, Gemini creating millions of agents that need physical capabilities
2. **Hardware Maturity**: Drones, robots, and IoT devices are finally reliable and affordable
3. **Connectivity**: 5G and Starlink enabling real-time control anywhere
4. **Regulatory Clarity**: FAA BVLOS rules, OSHA automation guidelines emerging
5. **Labor Economics**: $15+ minimum wage + labor shortages driving automation ROI

The Window Is Open

First-mover in this category captures the network effect. Once enterprises standardize on a physical API, switching costs are enormous. The next 24 months will determine who owns this layer.

The Vision

> "We're building the bridge between AI and physical reality. Today, AI agents can think but not touch. Tomorrow, through RealmOS, they'll be able to reach into the world—inspecting, moving, adjusting, delivering—with the same ease they send an email today. We're not just building an API; we're enabling a new category of intelligence that can finally act on what it knows."

RealmOS: Because Intelligence Wants to Touch the World.

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Appendix

Technical Deep Dive: Verification Protocol

RealmOS's cryptographic verification ensures actions were actually performed:

1. **Pre-Action Hash**: Device state + task parameters hashed
2. **Execution Recording**: Multi-sensor capture during action
3. **Post-Action Attestation**: Device + network nodes sign results
4. **Blockchain Anchor**: Hash committed to public chain
5. **Third-Party Audit**: Optional independent verification

Regulatory Landscape

FAA (Drones) - Part 107 operations - BVLOS waivers in select corridors - Remote ID compliant

OSHA (Robots) - Collaborative robot guidelines - Lockout/tagout procedures - Human-robot interaction standards

Data Privacy - GDPR, CCPA compliant - Data minimization by design - Customer data ownership

Comparable Exits

Company	Category	Exit Value
Twilio	Communications API	$15B+ (public)
Plaid	Financial Data API	$13.4B (acq)
Stripe	Payments API	$95B (private)
DroneDeploy	Drone Software	$500M+ (private)
Samsara	IoT Platform	$20B+ (public)

RealmOS combines the API model of Twilio/Stripe with the network effects of Uber and the hardware ecosystem of Samsara—targeting a $1.5T+ combined market.