Zus Trading Agent API Specification

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Executive Summary

What is the Zus Trading Agent Engine

The Zus Trading Agent Engine is a production-ready trading simulation platform that provides:

- **AI-Powered Trading Logs**: Real-time trading activity generation using Workers AI (Llama-3)
- **Multi-Tier Bot System**: Four distinct bot tiers (Protobot, Chainpulse, Titan, Omega) with varying ROI rates

- **User Balance Management**: REST API for managing user balances and tracking projected profits
- **Enterprise Integration**: Designed for seamless integration with existing financial platforms

Core Capabilities

Capability	Description
Trading Simulation	Autonomous trading activity with realistic P&L generation
Multi-User Support	Individual balance tracking per user via KV storage
Tier-Based ROI	Configurable profit projections based on investment tier
Real-Time Data	WebSocket integration with Binance for live market data
AI Narratives	Automated trading log generation using LLM technology

Use Cases

1. **Fintech Applications**: Add trading simulation features to portfolio management tools
2. **Trading Education**: Build educational platforms demonstrating market dynamics
3. **Investment Simulators**: Create paper trading environments with realistic outcomes
4. **White-Label Solutions**: Deploy branded trading simulation platforms

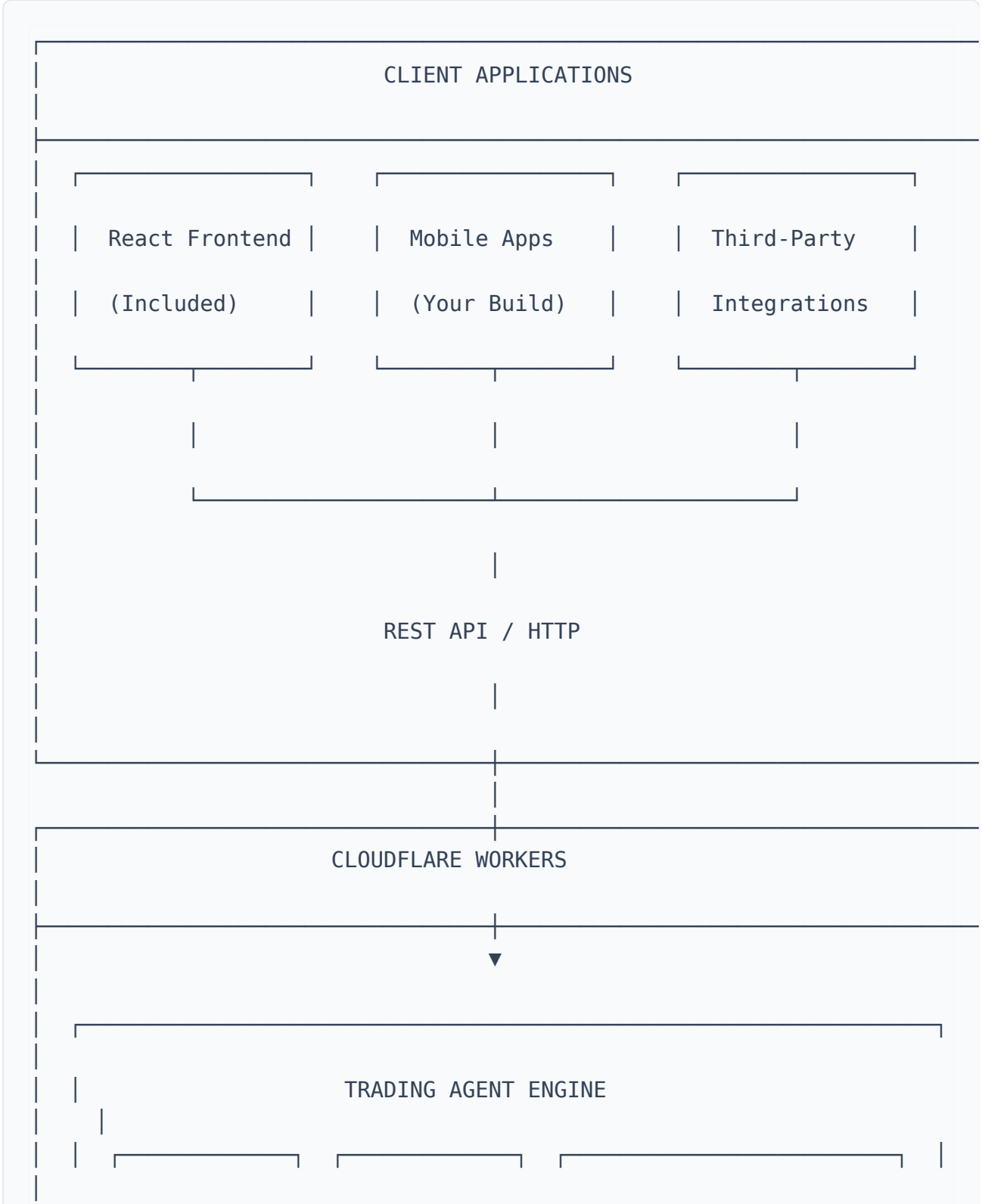
Integration Options

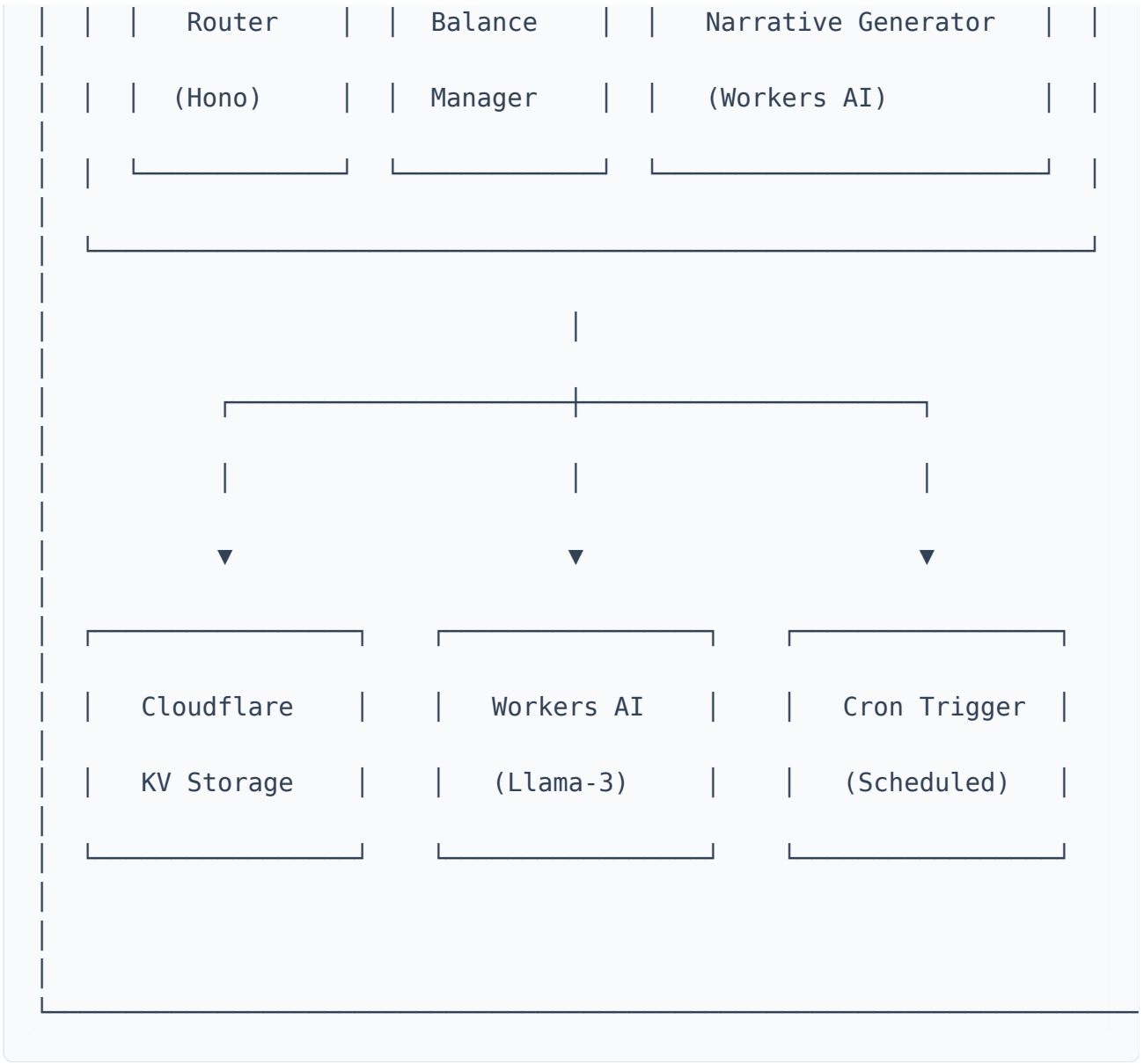
The Zus Trading Agent offers two integration paths:

Option	Description	Best For
API-Only Integration	Use REST endpoints to integrate trading features into your existing platform	Teams with existing frontends who need backend trading logic
Full-Stack Fork	Clone the entire repository including React frontend and Cloudflare Workers backend	Teams building new trading platforms from scratch

Architecture Overview

System Architecture




Router
(Hono)
Balance
Manager
Narrative Generator
(Workers AI)
Cloudflare
KV Storage
Workers AI
(Llama-3)
Cron Trigger
(Scheduled)

Technology Stack

Layer	Technology	Purpose
Frontend	React 19, TypeScript, Vite	User interface
Styling	TailwindCSS 4, Framer Motion	UI components and animations
State Management	Zustand	Client-side state
Charts	Lightweight Charts	Trading visualizations
Backend	Cloudflare Workers	Serverless API
Storage	Cloudflare KV	User balance persistence
AI	Workers AI (Llama-3-8b-instruct)	Trading log generation
Market Data	Binance WebSocket API	Real-time price feeds

Infrastructure Requirements

Cloudflare Services Required

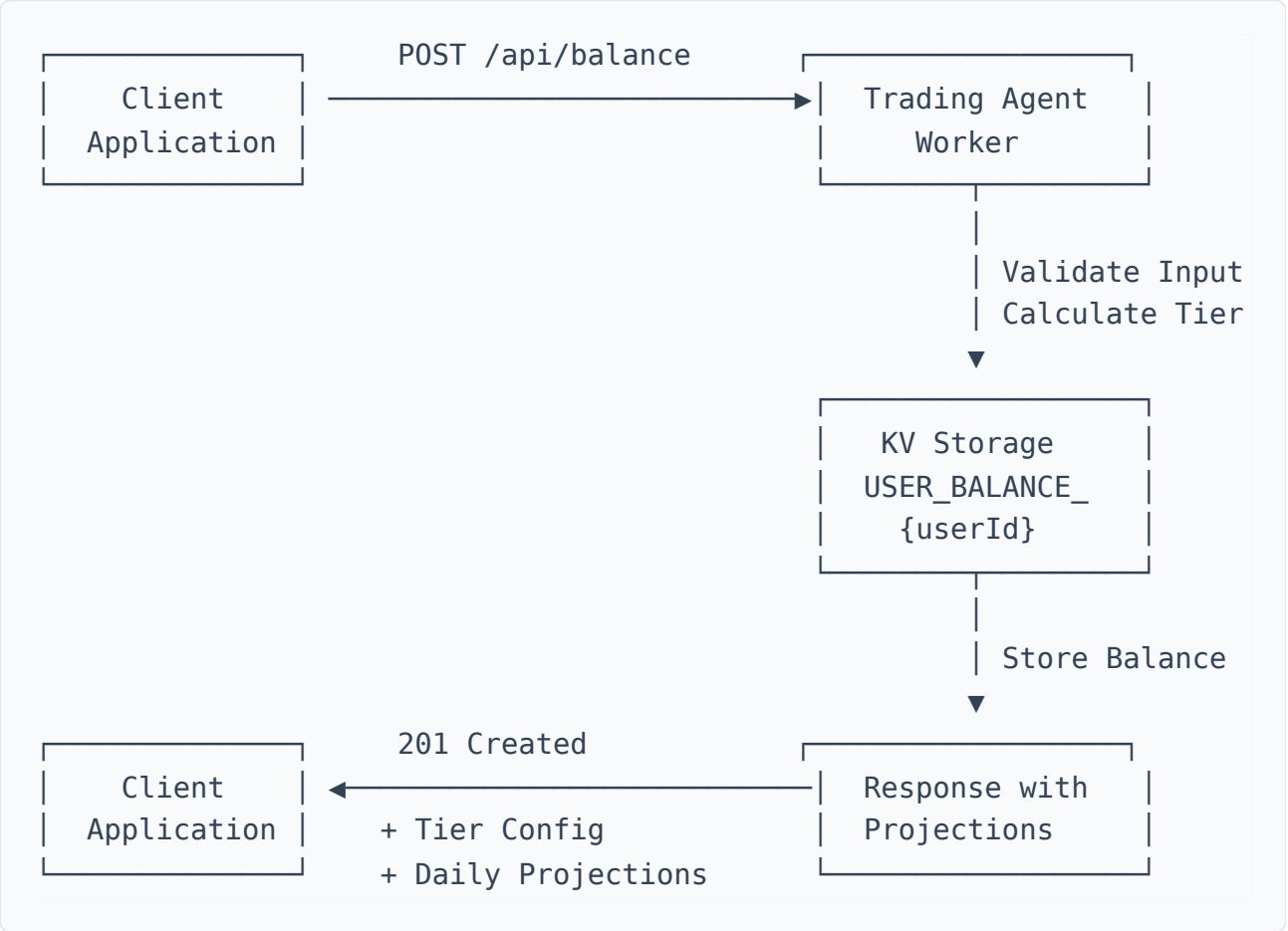
Service	Purpose	Configuration
Workers	API hosting	`compatibility_date: 2024-01-01`
KV Namespace	Data storage	Binding: `TRADING_CACHE`
Workers AI	Log generation	Binding: `AI`
Pages	Frontend hosting	Project: `orion-dashboard`

Environment Configuration

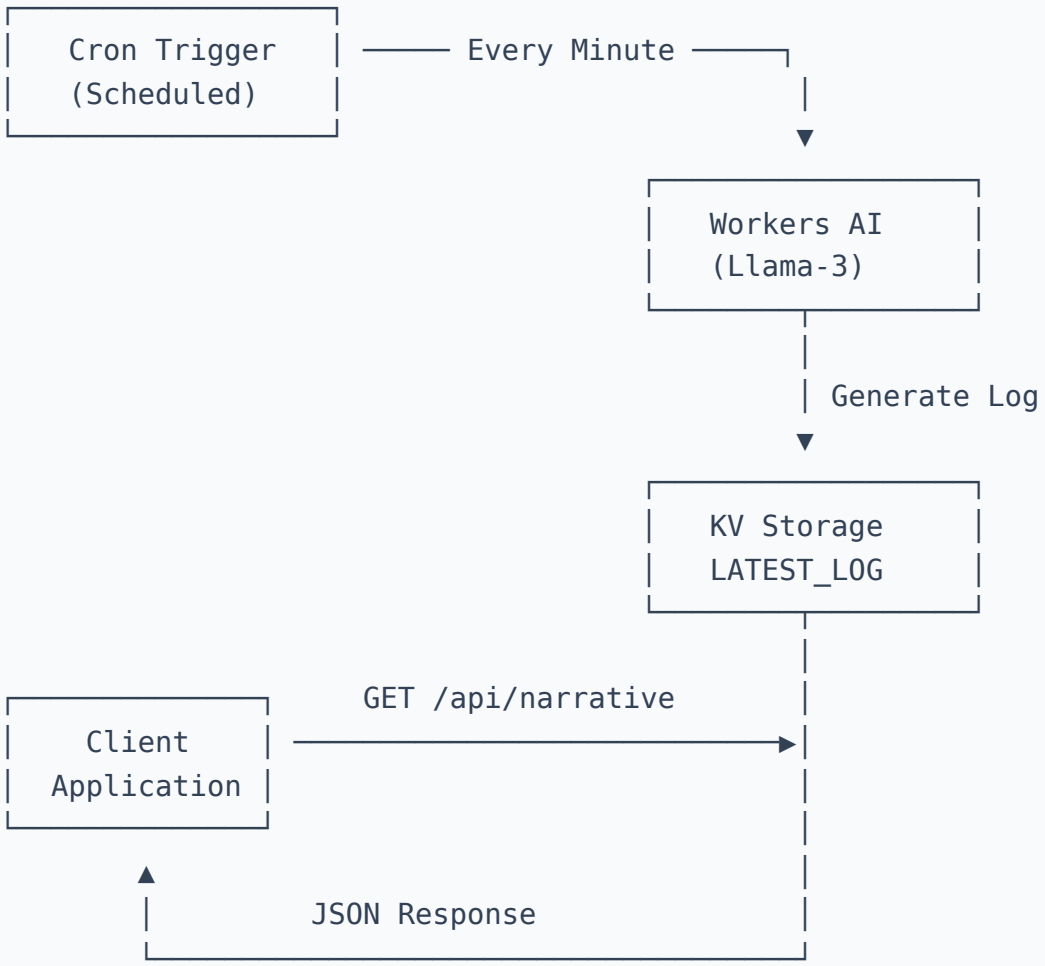
```toml
# wrangler.toml
name = "trading-agent-engine"
main = "src/index.ts"
compatibility_date = "2024-01-01"
compatibility_flags = ["nodejs_compat"]

[[kv_namespaces]]
binding = "TRADING_CACHE"
id = "your-kv-namespace-id"
preview_id = "your-preview-kv-namespace-id"

[ai]
binding = "AI"

[triggers]
crons = ["* * * * *"]
```

Data Flow

Balance Update Flow



Trading Narrative Flow



Bot Tier System

Overview

The Zus Trading Agent implements a four-tier bot system, each with distinct ROI characteristics, minimum stake requirements, and operational parameters.

Tier Specifications

Protobot (Entry Tier)

Parameter	Value
Name	Protobot
Minimum Stake	$100
Hourly ROI Range	0.10% - 0.12%
Daily ROI Range	0.80% - 0.96%
Trading Hours/Day	8
Trading Days/Week	6
ROI Withdrawal	After 24 hours
Capital Withdrawal	After 40 days
Investment Duration	365 days

Best For: New users testing the platform with minimal capital.

Chainpulse Bot (Standard Tier)

Parameter	Value
Name	Chainpulse Bot
Minimum Stake	$4,000
Hourly ROI Range	0.12% - 0.14%
Daily ROI Range	0.96% - 1.12%
Trading Hours/Day	8
Trading Days/Week	6
ROI Withdrawal	After 24 hours
Capital Withdrawal	After 45 days
Investment Duration	365 days

Best For: Serious investors seeking balanced risk/reward.

Titan Bot (Premium Tier)

Parameter	Value
Name	Titan Bot
Minimum Stake	$25,000
Hourly ROI Range	0.14% - 0.16%
Daily ROI Range	1.12% - 1.28%
Trading Hours/Day	8
Trading Days/Week	6
ROI Withdrawal	After 24 hours
Capital Withdrawal	After 65 days
Investment Duration	365 days

Best For: High-net-worth investors seeking enhanced returns.

Omega Bot (Elite Tier)

Parameter	Value
Name	Omega Bot
Minimum Stake	$50,000
Hourly ROI	0.225% (fixed)
Daily ROI	1.80% (fixed)
Trading Hours/Day	8
Trading Days/Week	6
ROI Withdrawal	After 24 hours
Capital Withdrawal	After 85 days
Investment Duration	365 days

Best For: Institutional investors requiring maximum returns with fixed rates.

Tier Comparison Table

Feature	Protobot	Chainpulse	Titan	Omega
Min. Stake	$100	$4,000	$25,000	$50,000
Daily ROI (Min)	0.80%	0.96%	1.12%	1.80%
Daily ROI (Max)	0.96%	1.12%	1.28%	1.80%
Capital Lock (Days)	40	45	65	85
Rate Type	Variable	Variable	Variable	Fixed

ROI Calculation Methodology

Daily Profit Calculation

```
Daily Profit (Min) = Balance × Daily ROI Min
Daily Profit (Max) = Balance × Daily ROI Max
```

Example for Chainpulse Bot with $10,000 balance:

```
Daily Profit (Min) = $10,000 × 0.0096 = $96.00
Daily Profit (Max) = $10,000 × 0.0112 = $112.00
```

Annual Projection

```
Annual Profit (Min) = Balance × Daily ROI Min × Trading Days Per Year
Annual Profit (Max) = Balance × Daily ROI Max × Trading Days Per Year

Trading Days Per Year = 6 days/week × 52 weeks = 312 days
```

Example for Titan Bot with $50,000 balance:

```
Annual Profit (Min) = $50,000 × 0.0112 × 312 = $174,720
Annual Profit (Max) = $50,000 × 0.0128 × 312 = $199,680
```

Tier Selection Logic

The system automatically selects the highest tier for which the user's balance qualifies:

```
function getBotTierForStake(stakeAmount: number): BotTier {
  if (stakeAmount >= 50000) return 'omega';
  if (stakeAmount >= 25000) return 'titan';
  if (stakeAmount >= 4000) return 'chainpulse';
  return 'protobot';
}
```

Manual Tier Selection

Users may explicitly select a lower tier than their balance qualifies for. However, selecting a higher tier than the balance supports will result in an error.

Validation Rule:

```
User Balance ≥ Selected Tier's Minimum Stake
```

API Reference

Base URL

```
Production: https://your-worker.workers.dev
Development: http://localhost:8787
```

Authentication

Currently, the API does not require authentication. For production deployments, implement authentication at the Cloudflare Workers level using:

- API Keys
- JWT Tokens

- Cloudflare Access

Endpoints Overview

Method	Endpoint	Description
`GET`	`/api/narrative`	Get latest trading log
`GET`	`/api/balance/:userId`	Retrieve user balance
`POST`	`/api/balance`	Create user balance
`PUT`	`/api/balance/:userId`	Update user balance
`GET`	`/health`	Health check

GET /api/narrative

Retrieves the latest AI-generated trading log.

Request

```
GET /api/narrative HTTP/1.1
Host: your-worker.workers.dev
Accept: application/json
```

Response

Success (200 OK):

```
{
  "log": "Long BTC @ 97,450 - RSI divergence on 15m, volume spike
confirming breakout",
  "timestamp": 1701234567890
}
```

Response Schema

```
interface NarrativeResponse {
  log: string;      // Trading log entry (max 100 characters)
  timestamp: number; // Unix timestamp in milliseconds
}
```

Code Examples

cURL:

```
curl -X GET "https://your-worker.workers.dev/api/narrative" \
  -H "Accept: application/json"
```

JavaScript (Fetch):

```
const response = await fetch('https://your-
worker.workers.dev/api/narrative');
const data = await response.json();
console.log(data.log);
```

Python (requests):

```python
import requests

response = requests.get('https://your-
worker.workers.dev/api/narrative')
data = response.json()
print(data['log'])
```

Notes

- Logs are generated every minute via cron trigger
- If no cached log exists, one is generated on-demand
- Response is cached for 5 seconds (CDN edge cache)
- KV storage TTL is 60 seconds

GET /api/balance/:userId

Retrieves the balance and tier configuration for a specific user.

Request

```http
GET /api/balance/user123 HTTP/1.1
Host: your-worker.workers.dev
Accept: application/json
```

Path Parameters

Parameter	Type	Required	Description
`userId`	string	Yes	Unique user identifier (1-128 chars, alphanumeric with hyphens/underscores)

Response

Success (200 OK):


```
{
  "status": "success",
  "data": {
    "userId": "user123",
    "balance": 10000,
    "currency": "USD",
    "botTier": "chainpulse",
    "botTierConfig": {
      "name": "Chainpulse Bot",
      "hourlyRoiMin": 0.0012,
      "hourlyRoiMax": 0.0014,
      "dailyRoiMin": 0.0096,
      "dailyRoiMax": 0.0112,
      "minimumStake": 4000,
      "tradingHoursPerDay": 8,
      "tradingDaysPerWeek": 6,
      "roiWithdrawalHours": 24,
      "capitalWithdrawalDays": 45,
      "investmentDurationDays": 365
    },
    "dailyTargetPct": {
      "min": 0.0096,
      "max": 0.0112
    },
    "projectedDailyProfit": {
      "min": 96,
      "max": 112
    },
    "lastUpdated": 1701234567890
  }
}
```


Error - User Not Found (404):

```
{
  "status": "error",
  "error": "User balance not found. Use POST /api/balance to set
initial balance."
}
```

Error - Invalid userId (400):

```
{
  "status": "error",
  "error": "Invalid userId format. Must be alphanumeric with
optional hyphens/underscores, 1-128 characters."
}
```

Code Examples

cURL:

```
curl -X GET "https://your-worker.workers.dev/api/balance/user123" \
  -H "Accept: application/json"
```

JavaScript (Fetch):

```javascript
async function getUserBalance(userId) {
  const response = await fetch(
    `https://your-worker.workers.dev/api/balance/${userId}`
  );

  if (!response.ok) {
    const error = await response.json();
    throw new Error(error.error);
  }

  const data = await response.json();
  return data.data;
}

// Usage
const balance = await getUserBalance('user123');
console.log(`Balance: $${balance.balance}`);
console.log(`Tier: ${balance.botTier}`);
console.log(`Daily Profit Range:
$${balance.projectedDailyProfit.min} -
$${balance.projectedDailyProfit.max}`);
```

Python (requests):

```python
import requests

def get_user_balance(user_id: str) -> dict:
    response = requests.get(
        f'https://your-worker.workers.dev/api/balance/{user_id}'
    )

    if response.status_code != 200:
        error = response.json()
        raise Exception(error.get('error', 'Unknown error'))

    return response.json()['data']

# Usage
balance = get_user_balance('user123')
print(f"Balance: ${balance['balance']}")
print(f"Tier: {balance['botTier']}")
```

POST /api/balance

Creates a new user balance record.

Request

```
POST /api/balance HTTP/1.1
Host: your-worker.workers.dev
Content-Type: application/json
Accept: application/json

{
  "userId": "user123",
  "balance": 10000,
  "currency": "USD",
  "botTier": "chainpulse"
}
```

Request Body

Field	Type	Required	Description
`userId`	string	Yes	Unique user identifier
`balance`	number	Yes	Initial balance (≥ 0)
`currency`	string	No	Currency code (default: "USD")
`botTier`	string	No	Bot tier (auto-selected if omitted)

Supported Currencies

```
USD, EUR, GBP, JPY, AUD, CAD, CHF, CNY, HKD, SGD
```

Valid Bot Tiers

```
protobot, chainpulse, titan, omega
```

Response

Success (201 Created):


```
{
  "status": "success",
  "data": {
    "userId": "user123",
    "balance": 10000,
    "currency": "USD",
    "botTier": "chainpulse",
    "botTierConfig": {
      "name": "Chainpulse Bot",
      "hourlyRoiMin": 0.0012,
      "hourlyRoiMax": 0.0014,
      "dailyRoiMin": 0.0096,
      "dailyRoiMax": 0.0112,
      "minimumStake": 4000,
      "tradingHoursPerDay": 8,
      "tradingDaysPerWeek": 6,
      "roiWithdrawalHours": 24,
      "capitalWithdrawalDays": 45,
      "investmentDurationDays": 365
    },
    "dailyTargetPct": {
      "min": 0.0096,
      "max": 0.0112
    },
    "projectedDailyProfit": {
      "min": 96,
      "max": 112
    },
    "lastUpdated": 1701234567890
  }
}
```


Error - Missing Required Fields (400):

```
{
  "status": "error",
  "error": "userId (string) and balance (number) are required"
}
```

Error - Insufficient Stake (400):

```
{
  "status": "error",
  "error": "Insufficient stake for Titan Bot. Minimum stake:
$25,000"
}
```

Error - Invalid Currency (400):

```
{
  "status": "error",
  "error": "Invalid currency. Supported currencies: USD, EUR, GBP,
JPY, AUD, CAD, CHF, CNY, HKD, SGD"
}
```

Code Examples

cURL:

```
curl -X POST "https://your-worker.workers.dev/api/balance" \
  -H "Content-Type: application/json" \
  -d '{
    "userId": "user123",
    "balance": 10000,
    "currency": "USD",
    "botTier": "chainpulse"
  }'
```

JavaScript (Fetch):

```
async function createUserBalance(userId, balance, currency = 'USD',
botTier) {
  const body = { userId, balance, currency };
  if (botTier) body.botTier = botTier;

  const response = await fetch('https://your-
worker.workers.dev/api/balance', {
    method: 'POST',
    headers: {
      'Content-Type': 'application/json',
    },
    body: JSON.stringify(body),
  });

  if (!response.ok) {
    const error = await response.json();
    throw new Error(error.error);
  }

  return (await response.json()).data;
}

// Usage - Auto tier selection
const user1 = await createUserBalance('user123', 10000);
console.log(`Auto-selected tier: ${user1.botTier}`); // chainpulse

// Usage - Manual tier selection
const user2 = await createUserBalance('user456', 50000, 'USD',
'titan');
console.log(`Selected tier: ${user2.botTier}`); // titan
```

Python (requests):

```python
import requests

def create_user_balance(
    user_id: str,
    balance: float,
    currency: str = 'USD',
    bot_tier: str = None
) -> dict:
    payload = {
        'userId': user_id,
        'balance': balance,
        'currency': currency,
    }

    if bot_tier:
        payload['botTier'] = bot_tier

    response = requests.post(
        'https://your-worker.workers.dev/api/balance',
        json=payload
    )

    if response.status_code != 201:
        error = response.json()
        raise Exception(error.get('error', 'Unknown error'))

    return response.json()['data']

# Usage
user = create_user_balance('user123', 10000)
print(f"Created user with tier: {user['botTier']}")
```

PUT /api/balance/:userId

Updates an existing user's balance.

Request

```
PUT /api/balance/user123 HTTP/1.1
Host: your-worker.workers.dev
Content-Type: application/json
Accept: application/json

{
  "balance": 15000,
  "currency": "USD",
  "botTier": "titan"
}
```

Path Parameters

Parameter	Type	Required	Description
`userId`	string	Yes	Unique user identifier

Request Body

Field	Type	Required	Description
`balance`	number	Yes	New balance (≥ 0)
`currency`	string	No	Currency code (default: "USD")
`botTier`	string	No	Bot tier (auto-selected if omitted)

Response

Success (200 OK):

```
{
  "status": "success",
  "data": {
    "userId": "user123",
    "balance": 15000,
    "currency": "USD",
    "botTier": "titan",
    "botTierConfig": {
      "name": "Titan Bot",
      "hourlyRoiMin": 0.0014,
      "hourlyRoiMax": 0.0016,
      "dailyRoiMin": 0.0112,
      "dailyRoiMax": 0.0128,
      "minimumStake": 25000,
      "tradingHoursPerDay": 8,
      "tradingDaysPerWeek": 6,
      "roiWithdrawalHours": 24,
      "capitalWithdrawalDays": 65,
      "investmentDurationDays": 365
    },
    "dailyTargetPct": {
      "min": 0.0112,
      "max": 0.0128
    },
    "projectedDailyProfit": {
      "min": 168,
      "max": 192
    },
    "lastUpdated": 1701234567890
  }
}
```


Code Examples

cURL:

```
curl -X PUT "https://your-worker.workers.dev/api/balance/user123" \
  -H "Content-Type: application/json" \
  -d '{
    "balance": 15000,
    "botTier": "titan"
  }'
```

JavaScript (Fetch):

```javascript
async function updateUserBalance(userId, balance, currency,
botTier) {
  const body = { balance };
  if (currency) body.currency = currency;
  if (botTier) body.botTier = botTier;

  const response = await fetch(
    `https://your-worker.workers.dev/api/balance/${userId}`,
    {
      method: 'PUT',
      headers: {
        'Content-Type': 'application/json',
      },
      body: JSON.stringify(body),
    }
  );

  if (!response.ok) {
    const error = await response.json();
    throw new Error(error.error);
  }

  return (await response.json()).data;
}

// Upgrade user balance and tier
const updated = await updateUserBalance('user123', 50000, 'USD',
'omega');
console.log(`New tier: ${updated.botTier}`);
console.log(`New daily profit: $${updated.projectedDailyProfit.min}
- $${updated.projectedDailyProfit.max}`);
```

Python (requests):

```python
import requests

def update_user_balance(
    user_id: str,
    balance: float,
    currency: str = None,
    bot_tier: str = None
) -> dict:
    payload = {'balance': balance}

    if currency:
        payload['currency'] = currency
    if bot_tier:
        payload['botTier'] = bot_tier

    response = requests.put(
        f'https://your-worker.workers.dev/api/balance/{user_id}',
        json=payload
    )

    if response.status_code != 200:
        error = response.json()
        raise Exception(error.get('error', 'Unknown error'))

    return response.json()['data']

# Usage
updated = update_user_balance('user123', 50000, bot_tier='omega')
print(f"Updated tier: {updated['botTier']}")
```

GET /health

Health check endpoint for monitoring and load balancer configuration.

Request

```
GET /health HTTP/1.1
Host: your-worker.workers.dev
Accept: application/json
```

Response

Success (200 OK):

```
{
  "status": "ok",
  "service": "trading-agent-engine"
}
```

Code Examples

cURL:

```
curl -X GET "https://your-worker.workers.dev/health"
```

JavaScript:

```
async function checkHealth() {
  const response = await fetch('https://your-
worker.workers.dev/health');
  const data = await response.json();
  return data.status === 'ok';
}
```

Data Models

TypeScript Interface Definitions

UserBalance

```typescript
interface UserBalance {
  userId: string;      // Unique identifier (1-128 chars)
  balance: number;     // Current balance (≥ 0)
  currency: string;    // ISO currency code
  botTier: BotTier;    // Selected bot tier
  lastUpdated: number; // Unix timestamp (milliseconds)
}
```

BotTier

```typescript
type BotTier = 'protobot' | 'chainpulse' | 'titan' | 'omega';
```

BotTierConfig

```
interface BotTierConfig {
  name: string;                  // Display name
  hourlyRoiMin: number;          // Minimum hourly ROI (decimal)
  hourlyRoiMax: number;          // Maximum hourly ROI (decimal)
  dailyRoiMin: number;           // Minimum daily ROI (8 × hourly)
  dailyRoiMax: number;           // Maximum daily ROI (8 × hourly)
  minimumStake: number;          // Minimum balance required
  tradingHoursPerDay: number;    // Active trading hours
  tradingDaysPerWeek: number;    // Active trading days
  roiWithdrawalHours: number;    // Hours until ROI withdrawal
  capitalWithdrawalDays: number; // Days until capital withdrawal
  investmentDurationDays: number;// Total investment period
}
```

BalanceResponse

```typescript
interface BalanceResponse {
  status: 'success' | 'error';
  data?: {
    userId: string;
    balance: number;
    currency: string;
    botTier: BotTier;
    botTierConfig: BotTierConfig;
    dailyTargetPct: {
      min: number;
      max: number;
    };
    projectedDailyProfit: {
      min: number;
      max: number;
    };
    lastUpdated: number;
  };
  error?: string;
}
```

NarrativeResponse

```typescript
interface NarrativeResponse {
  log: string;       // AI-generated trading log
  timestamp: number; // Generation timestamp
}
```

Integration Guides

Multi-User Platform Integration (API-Only)

This guide covers integrating the Trading Agent API into your existing platform without forking the repository.

Step 1: Register New Users

When a user signs up for your platform and deposits funds:

```
async function onUserDeposit(userId, amount) {
  try {
    const response = await fetch('https://your-
worker.workers.dev/api/balance', {
      method: 'POST',
      headers: { 'Content-Type': 'application/json' },
      body: JSON.stringify({
        userId: userId,
        balance: amount,
        currency: 'USD'
      })
    });

    const result = await response.json();

    if (result.status === 'success') {
      // Store tier info in your database
      await saveUserTierInfo(userId, result.data.botTier,
result.data.botTierConfig);

      // Notify user of their tier assignment
      showNotification(`Welcome! You've been assigned to
${result.data.botTierConfig.name}`);
    }
  } catch (error) {
    console.error('Failed to register user balance:', error);
  }
}
```

Step 2: Display Profit Projections

Fetch and display projected profits to users:

```
async function displayProfitProjection(userId) {
  const response = await fetch(`https://your-
worker.workers.dev/api/balance/${userId}`);
  const result = await response.json();

  if (result.status === 'success') {
    const { balance, botTierConfig, projectedDailyProfit } =
result.data;

    // Calculate weekly and monthly projections
    const weeklyProfit = {
      min: projectedDailyProfit.min *
botTierConfig.tradingDaysPerWeek,
      max: projectedDailyProfit.max *
botTierConfig.tradingDaysPerWeek
    };

    const monthlyProfit = {
      min: projectedDailyProfit.min *
botTierConfig.tradingDaysPerWeek * 4,
      max: projectedDailyProfit.max *
botTierConfig.tradingDaysPerWeek * 4
    };

    // Update UI
    document.getElementById('daily-profit').textContent =
      `$${projectedDailyProfit.min.toFixed(2)} -
$${projectedDailyProfit.max.toFixed(2)}`;
    document.getElementById('weekly-profit').textContent =
      `$${weeklyProfit.min.toFixed(2)} -
$${weeklyProfit.max.toFixed(2)}`;
    document.getElementById('monthly-profit').textContent =
      `$${monthlyProfit.min.toFixed(2)} -
$${monthlyProfit.max.toFixed(2)}`;
  }
}
```

Step 3: Handle Balance Updates

When users deposit or withdraw:

```
async function handleBalanceChange(userId, newBalance) {
  const response = await fetch(`https://your-
worker.workers.dev/api/balance/${userId}`, {
    method: 'PUT',
    headers: { 'Content-Type': 'application/json' },
    body: JSON.stringify({ balance: newBalance })
  });

  const result = await response.json();

  if (result.status === 'success') {
    // Check if tier changed
    const previousTier = await getUserStoredTier(userId);
    if (previousTier !== result.data.botTier) {
      showNotification(`Congratulations! You've been upgraded to
${result.data.botTierConfig.name}`);
    }

    // Update stored tier info
    await saveUserTierInfo(userId, result.data.botTier,
result.data.botTierConfig);
  }
}
```

Step 4: Polling for Live Data

For real-time trading activity display:

```
class TradingActivityPoller {
  constructor(updateInterval = 5000) {
    this.interval = updateInterval;
    this.isRunning = false;
  }

  start() {
    this.isRunning = true;
    this.poll();
  }

  stop() {
    this.isRunning = false;
  }

  async poll() {
    if (!this.isRunning) return;

    try {
      const response = await fetch('https://your-
worker.workers.dev/api/narrative');
      const data = await response.json();

      // Update UI with new trading log
      this.updateActivityFeed(data.log, data.timestamp);
    } catch (error) {
      console.error('Polling failed:', error);
    }

    // Schedule next poll
    setTimeout(() => this.poll(), this.interval);
  }

  updateActivityFeed(log, timestamp) {
    const feed = document.getElementById('activity-feed');
    const entry = document.createElement('div');
    entry.className = 'activity-entry';
    entry.innerHTML = `
      <span class="timestamp">${new
Date(timestamp).toLocaleTimeString()}</span>
      <span class="log">${log}</span>
```

```
    `;
    feed.prepend(entry);

    // Keep only last 50 entries
    while (feed.children.length > 50) {
      feed.removeChild(feed.lastChild);
    }
  }
}

// Usage
const poller = new TradingActivityPoller(5000);
poller.start();
```

Frontend JavaScript API

If embedding the Trading Agent frontend, use the global window functions:

```
// Get current trading status
const status = window.getTradingAgentStatus();
console.log(status.data.wallet_balance);
console.log(status.data.bot_tier);
console.log(status.data.projected_daily_profit);

// Set user balance (triggers tier recalculation)
const result = window.setTradingAgentBalance(25000);
console.log(result.bot_tier); // 'titan'

// Explicitly set bot tier
const tierResult = window.setBotTier('chainpulse');
console.log(tierResult.bot_tier_config);

// Get all tier configurations
const tiers = window.getBotTiers();
console.log(tiers.omega.minimumStake); // 50000
```

Full-Stack Fork Integration

This guide covers forking the entire repository to build your platform on top of it.

Step 1: Fork and Clone

```
# Fork via GitHub UI or CLI
gh repo fork sherrymcadams001-afk/Zus

# Clone your fork
git clone https://github.com/YOUR_USERNAME/Zus.git
cd Zus
```

Step 2: Install Dependencies

```
# Install frontend dependencies
npm install

# Install backend dependencies
cd backend
npm install
cd ..
```

Step 3: Configure Cloudflare

Create KV namespace:

```
cd backend
npx wrangler kv:namespace create "TRADING_CACHE"
```

Update `backend/wrangler.toml`:

```
name = "your-trading-platform"
main = "src/index.ts"
compatibility_date = "2024-01-01"
compatibility_flags = ["nodejs_compat"]

[[kv_namespaces]]
binding = "TRADING_CACHE"
id = "YOUR_KV_NAMESPACE_ID"
preview_id = "YOUR_PREVIEW_KV_NAMESPACE_ID"

[ai]
binding = "AI"

[triggers]
crons = ["* * * * *"]
```

Step 4: Local Development

```
# Terminal 1: Run frontend
npm run dev

# Terminal 2: Run backend
cd backend
npm run dev
```

Step 5: Customize the Platform

Modify Bot Tiers:

Edit `backend/src/index.ts`:

```
const BOT_TIERS: Record<BotTier, BotTierConfig> = {
  protobot: {
    name: 'Your Custom Tier Name',
    hourlyRoiMin: 0.002,  // Customize ROI
    hourlyRoiMax: 0.003,
    // ... other config
  },
  // ... other tiers
};
```

Customize UI Components:

Modify React components in `src/components/`:

- `MainChart.tsx` - Trading chart
- `Watchlist.tsx` - Asset list
- `LiveTrades.tsx` - Trade history
- `BotActivityLog.tsx` - Activity feed

Add Custom Styling:

Edit `src/index.css` and `tailwind.config.ts`:

```
@layer base {
  :root {
    --orion-neon-cyan: your-brand-color;
    --orion-neon-green: your-success-color;
    --orion-neon-red: your-error-color;
  }
}
```

Step 6: Deploy

Deploy Backend:

```
cd backend
npx wrangler deploy
```

Deploy Frontend:

```
npm run build
npx wrangler pages deploy dist --project-name=your-project-name
```

Step 7: Set Up CI/CD

The repository includes `.github/workflows/deploy.yml`:

Configure GitHub Secrets:

- `CLOUDFLARE_API_TOKEN`
- `CLOUDFLARE_ACCOUNT_ID`

Push to `main` branch to trigger automatic deployment.

Security & Best Practices

Input Validation Rules

userId Validation

```
function isValidUserId(userId: string): boolean {
  if (!userId || typeof userId !== 'string') return false;
  if (userId.length < 1 || userId.length > 128) return false;
  return /^[a-zA-Z0-9_-]+$/.test(userId);
}
```

Rules:

- Required field
- 1-128 characters
- Alphanumeric only
- Hyphens (`-`) and underscores (`_`) allowed
- Case-sensitive

Balance Validation

- Must be a number
- Must be ≥ 0
- If botTier specified, must meet minimum stake

Currency Validation

```
const SUPPORTED_CURRENCIES = [
  'USD', 'EUR', 'GBP', 'JPY', 'AUD',
  'CAD', 'CHF', 'CNY', 'HKD', 'SGD'
];
```

Bot Tier Validation

```
const VALID_BOT_TIERS = ['protobot', 'chainpulse', 'titan',
'omega'];
```

Rate Limiting Recommendations

For production deployments, implement rate limiting:

```
// Example: Using Cloudflare Rate Limiting
export default {
  async fetch(request: Request, env: Env, ctx: ExecutionContext) {
    // Check rate limit (example: 100 requests per minute per IP)
    const ip = request.headers.get('CF-Connecting-IP');
    const rateLimitKey = `rate_limit:${ip}`;

    const count = await env.TRADING_CACHE.get(rateLimitKey);
    if (count && parseInt(count) > 100) {
      return new Response('Rate limit exceeded', { status: 429 });
    }

    // Increment counter
    await env.TRADING_CACHE.put(
      rateLimitKey,
      String((parseInt(count || '0') + 1)),
      { expirationTtl: 60 }
    );

    // Process request...
  }
};
```

Error Handling Patterns

Consistent Error Response Format

```
interface ErrorResponse {
  status: 'error';
  error: string;
  code?: string;  // Optional error code
}
```

Client-Side Error Handling

```
async function apiCall(endpoint, options = {}) {
  try {
    const response = await fetch(endpoint, options);
    const data = await response.json();

    if (data.status === 'error') {
      throw new ApiError(data.error, response.status);
    }

    return data;
  } catch (error) {
    if (error instanceof ApiError) {
      // Handle API errors
      if (error.statusCode === 400) {
        showValidationError(error.message);
      } else if (error.statusCode === 404) {
        showNotFoundError(error.message);
      } else {
        showGenericError(error.message);
      }
    } else {
      // Handle network errors
      showNetworkError('Unable to connect to server');
    }
    throw error;
  }
}

class ApiError extends Error {
  constructor(message, statusCode) {
    super(message);
    this.statusCode = statusCode;
    this.name = 'ApiError';
  }
}
```

CORS Configuration

The API includes permissive CORS headers for development:

```
const corsHeaders = {
  'Access-Control-Allow-Origin': '*',
  'Access-Control-Allow-Methods': 'GET, POST, PUT, OPTIONS',
  'Access-Control-Allow-Headers': 'Content-Type',
};
```

For production, restrict to your domains:

```
const corsHeaders = {
  'Access-Control-Allow-Origin': 'https://your-domain.com',
  'Access-Control-Allow-Methods': 'GET, POST, PUT, OPTIONS',
  'Access-Control-Allow-Headers': 'Content-Type, Authorization',
};
```

Appendices

Appendix A: Glossary

Term	Definition
Bot Tier	Investment level determining ROI rates and features
KV Storage	Cloudflare's key-value storage for persistent data
ROI	Return on Investment, expressed as decimal (0.01 = 1%)
Stake	User's invested balance
Workers AI	Cloudflare's AI inference platform
Trading Narrative	AI-generated log describing simulated trading activity

Appendix B: ROI Calculation Formulas

Daily ROI Calculation

```
Hourly ROI = Base Rate × Market Modifier
Daily ROI = Hourly ROI × Trading Hours Per Day
Daily Profit = Balance × Daily ROI
```

Annual Projection

```
Trading Days Per Year = Trading Days Per Week × 52
Annual Profit (Min) = Balance × Daily ROI Min × Trading Days Per Year
Annual Profit (Max) = Balance × Daily ROI Max × Trading Days Per Year
```

Example Calculation

For a $10,000 balance in Chainpulse tier:

```
Daily ROI Min = 0.0096 (0.96%)
Daily ROI Max = 0.0112 (1.12%)

Daily Profit Min = $10,000 × 0.0096 = $96
Daily Profit Max = $10,000 × 0.0112 = $112

Weekly Profit Min = $96 × 6 = $576
Weekly Profit Max = $112 × 6 = $672

Annual Profit Min = $96 × 312 = $29,952
Annual Profit Max = $112 × 312 = $34,944
```

Appendix C: Complete Code Examples

Full Integration Example (JavaScript)

```
class TradingAgentClient {
  constructor(baseUrl) {
    this.baseUrl = baseUrl;
  }

  async createUser(userId, balance, currency = 'USD', botTier =
null) {
    const body = { userId, balance, currency };
    if (botTier) body.botTier = botTier;

    const response = await fetch(`${this.baseUrl}/api/balance`, {
      method: 'POST',
      headers: { 'Content-Type': 'application/json' },
      body: JSON.stringify(body)
    });

    return this._handleResponse(response);
  }

  async getUser(userId) {
    const response = await
fetch(`${this.baseUrl}/api/balance/${userId}`);
    return this._handleResponse(response);
  }

  async updateUser(userId, balance, currency = null, botTier =
null) {
    const body = { balance };
    if (currency) body.currency = currency;
    if (botTier) body.botTier = botTier;

    const response = await
fetch(`${this.baseUrl}/api/balance/${userId}`, {
      method: 'PUT',
      headers: { 'Content-Type': 'application/json' },
      body: JSON.stringify(body)
```

```
    });

    return this._handleResponse(response);
  }

  async getNarrative() {
    const response = await fetch(`${this.baseUrl}/api/narrative`);
    return response.json();
  }

  async healthCheck() {
    const response = await fetch(`${this.baseUrl}/health`);
    const data = await response.json();
    return data.status === 'ok';
  }

  async _handleResponse(response) {
    const data = await response.json();

    if (data.status === 'error') {
      throw new Error(data.error);
    }

    return data.data;
  }
}

// Usage
const client = new TradingAgentClient('https://your-
worker.workers.dev');

// Create user
const user = await client.createUser('user123', 10000);
console.log(`User tier: ${user.botTier}`);

// Get profit projections
const daily = user.projectedDailyProfit;
console.log(`Daily profit: $${daily.min} - $${daily.max}`);

// Update balance
const updated = await client.updateUser('user123', 50000);
console.log(`New tier: ${updated.botTier}`);
```

Full Integration Example (Python)

```python
import requests
from typing import Optional, Dict, Any

class TradingAgentClient:
    def __init__(self, base_url: str):
        self.base_url = base_url

    def create_user(
        self,
        user_id: str,
        balance: float,
        currency: str = 'USD',
        bot_tier: Optional[str] = None
    ) -> Dict[str, Any]:
        payload = {
            'userId': user_id,
            'balance': balance,
            'currency': currency
        }

        if bot_tier:
            payload['botTier'] = bot_tier

        response = requests.post(
            f'{self.base_url}/api/balance',
            json=payload
        )

        return self._handle_response(response)

    def get_user(self, user_id: str) -> Dict[str, Any]:
        response = requests.get(
            f'{self.base_url}/api/balance/{user_id}'
        )
        return self._handle_response(response)

    def update_user(
        self,
        user_id: str,
```

```
        balance: float,
        currency: Optional[str] = None,
        bot_tier: Optional[str] = None
    ) -> Dict[str, Any]:
        payload = {'balance': balance}

        if currency:
            payload['currency'] = currency
        if bot_tier:
            payload['botTier'] = bot_tier

        response = requests.put(
            f'{self.base_url}/api/balance/{user_id}',
            json=payload
        )

        return self._handle_response(response)

    def get_narrative(self) -> Dict[str, Any]:
        response = requests.get(f'{self.base_url}/api/narrative')
        return response.json()

    def health_check(self) -> bool:
        response = requests.get(f'{self.base_url}/health')
        data = response.json()
        return data.get('status') == 'ok'

    def _handle_response(self, response: requests.Response) ->
Dict[str, Any]:
        data = response.json()

        if data.get('status') == 'error':
            raise Exception(data.get('error', 'Unknown error'))

        return data.get('data')


# Usage
if __name__ == '__main__':
    client = TradingAgentClient('https://your-worker.workers.dev')

    # Create user
    user = client.create_user('user123', 10000)
```

```
    print(f"User tier: {user['botTier']}")

    # Get profit projections
    daily = user['projectedDailyProfit']
    print(f"Daily profit: ${daily['min']} - ${daily['max']}")

    # Update balance
    updated = client.update_user('user123', 50000)
    print(f"New tier: {updated['botTier']}")
```

Appendix D: Troubleshooting Guide

Common Issues

Issue: "User balance not found" (404)

Cause: The userId has not been registered yet.

Solution: Use `POST /api/balance` to create the user first.

```
curl -X POST "https://your-worker.workers.dev/api/balance" \
  -H "Content-Type: application/json" \
  -d '{"userId": "user123", "balance": 1000}'
```

Issue: "Invalid userId format" (400)

Cause: The userId contains invalid characters or is too long.

Solution: Ensure userId:

- Is 1-128 characters
- Contains only alphanumeric characters, hyphens, or underscores
- Does not contain spaces or special characters

Issue: "Insufficient stake for [Tier Name]" (400)

Cause: The balance is below the minimum stake for the selected tier.

Solution: Either:

1. Increase the balance to meet the minimum
2. Select a lower tier
3. Omit `botTier` to use auto-selection

Issue: CORS Errors

Cause: Browser blocking cross-origin requests.

Solution: The API includes CORS headers. If issues persist:

1. Ensure you're making requests from an allowed origin
2. Check that preflight (OPTIONS) requests are succeeding
3. For development, use a local proxy or disable CORS in browser

---

Issue: Empty Narrative Response

Cause: AI generation failed or no cached log exists.

Solution: The system auto-generates on demand. If persistent:

1. Check Workers AI binding is configured
2. Verify cron trigger is running
3. Check Cloudflare dashboard for errors

Appendix E: FAQ

Q: How often are trading narratives generated?

A: Every minute via cron trigger. On-demand generation occurs if no cached log exists.

Q: Can I use multiple currencies for different users?

A: Yes, each user can have a different currency. Supported: USD, EUR, GBP, JPY, AUD, CAD, CHF, CNY, HKD, SGD.

Q: What happens if a user's balance drops below their tier minimum?

A: The tier is not automatically downgraded. Use `PUT /api/balance` with auto-selection (omit `botTier`) to recalculate.

Q: Is user data encrypted?

A: Data is stored in Cloudflare KV with encryption at rest. For additional security, implement your own encryption layer.

Q: What's the difference between hourly and daily ROI?

A: Daily ROI = Hourly ROI × Trading Hours (8). The system uses daily ROI for projections.

Q: Can I customize the bot tier configurations?

A: Yes, modify the `BOT_TIERS` constant in `backend/src/index.ts` and redeploy.

Q: How do I add authentication?

A: Implement authentication at the Workers level using:

- Cloudflare Access
- Custom JWT validation
- API key verification

Q: Is there a webhook for balance changes?

A: Not currently. Implement polling or add webhook functionality in your fork.

Q: What's the data retention policy?

A: KV data persists indefinitely unless explicitly deleted or TTL-expired.

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