Trust16: A Blockchain-Based Game of Strategy and Cooperation

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August 6, 2024

Abstract

Trust16 is an innovative blockchain-based game that explores the dynamics of trust, cooperation, and competition in a digital environment. Built on the Aptos network, this pioneering platform combines elements of game theory, social psychology, and cryptographic technology to create a unique gaming experience with far-reaching implications for research and social good.

Players engage in strategic matches where they must decide whether to cooperate or compete, with outcomes determining reward distribution. The game features a sophisticated character trait system, with 16 distinct traits that evolve based on player behavior, adding depth to gameplay and strategic decision-making. Trust16 incorporates multiple game modes, a native token economy, and an AI bot system, catering to a wide range of player preferences and skill levels.

Beyond entertainment, Trust16 serves as a valuable research tool, offering insights into human behavior, decision-making processes, and the dynamics of trust in controlled, incentivized environments. The platform's data collection capabilities, coupled with its commitment to ethical considerations and academic partnerships, position it as a potential catalyst for advancing our understanding of cooperation and conflict resolution in the digital age.

This whitepaper outlines the game mechanics, technical architecture, tokenomics, and long-term vision of Trust16, presenting a comprehensive overview of a project that aims to push the boundaries of blockchain gaming while contributing to meaningful social and scientific progress.

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1 Table of Contents

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executive-summary

1.1 Executive Summary

Trust16 is an innovative blockchain-based game that challenges players to navigate the delicate balance between cooperation and competition. Built on the Aptos network, Trust16 combines elements of game theory, social interaction, and cryptographic security to create a unique gaming experience. Players engage in strategic matches, making decisions to cooperate or compete, with outcomes determining reward distribution. The game features 16 distinct character traits, a sophisticated prediction system, seasonal play, and an AI bot mode, offering a rich, multifaceted gaming experience that goes beyond mere entertainment to serve as a tool for research and social good.

introduction

1.2 Introduction

In an era where trust is increasingly valuable yet scarce, Trust16 emerges as a social experiment disguised as a game. It explores human nature, decision-making processes, and the dynamics of trust in a controlled, blockchain-powered environment. By incentivizing both cooperation and competition, Trust16 creates a complex ecosystem where strategy, psychology, and game theory intersect.

The name "Trust16" encapsulates the core concept of the game - trust - and the 16 unique character traits that players can embody. This duality represents the game's focus on both individual strategy and the broader dynamics of group interaction.

game-mechanics

1.3 Game Mechanics

Trust16 offers three distinct game modes, each designed to cater to different player needs and time commitments:

campaign-mode

1.3.1 Campaign Mode

- Purpose: Tutorial and trait introduction

- Gameplay:

    - Players compete against AI bots
    - Gradually introduces game mechanics and strategies
    - Features all 16 character traits for players to interact with

- Benefits:

    - Safe environment for new players to learn
    - No stakes, allowing for experimentation
    - Prepares players for PvP modes

short-game-mode

1.3.2 Short Game Mode

- Duration: Maximum 1 minute per game
- Gameplay:
    - Fast-paced PvP matches
    - Players drop coins into a central rectangle to make decisions
    - 10 rounds of quick decision-making
- Features:
    - Visual representation of choices (coin dropping)
    - Rapid-fire decision making
    - Ideal for quick games on-the-go
- Outcome: Determined by the cumulative choices over 10 rounds

long-game-mode

1.3.3 Long Game Mode

- Duration: Variable, based on player-set chat time
- Gameplay:
    - In-depth PvP matches with strategic elements
    - Includes a chat phase for negotiation and strategy discussion
    - Single round with higher stakes
- Features:
    - Secure, time-limited chat room
    - Complex decision-making incorporating negotiation and trust-building
    - Higher potential rewards
- Outcome: Determined by a single, high-stakes decision

core-mechanics-applicable-to-all-modes

1.3.4 Core Mechanics (applicable to all modes)

1. Setup: Players connect wallets and select bet amounts (except in Campaign mode)
2. Matchmaking: Smart contract pairs players with similar preferences (for PvP modes)
3. Decision Phase: Players choose to cooperate (green) or compete (red)
4. Outcome: Rewards are distributed based on choices:

    - Green-Green: Both win, sharing deposits plus a bonus
    - Green-Red: Competing player claims entire pot
    - Red-Red: No rewards; deposits added to game's reward pool

trait-system

1.3.5 Trait System

- Character traits are assigned based on playstyle across all game modes

- Trait visibility and progression apply in all PvP modes

- Campaign mode introduces players to all traits through bot interactions

technical-architecture

1.4 Technical Architecture

blockchain-integration
1.4.1 Blockchain Integration

Trust16 leverages the Aptos blockchain for its smart contract functionality, ensuring transparent and immutable game outcomes.

smart-contract
1.4.2 Smart Contract

The core smart contract handles: - Player matching - Bet escrow - Outcome verification - Reward distribution

cryptographic-fairness
1.4.3 Cryptographic Fairness

Verifiable Random Functions (VRFs) or commitment schemes are employed to ensure fair play and prevent result manipulation.

frontend
1.4.4 Frontend

A user-friendly interface built with React and Web3 libraries provides seamless wallet integration and game interaction.

tokenomics-and-game-economy
1.5 Tokenomics and Game Economy

Trust16's economy is designed to be flexible, sustainable, and engaging, incentivizing both cooperation and strategic gameplay. While the native token, $TRUST, is at the core of the game ecosystem, Trust16 also supports multiple currencies to enhance accessibility and user choice.

token-utility-and-multi-currency-support
1.5.1 Token Utility and Multi-Currency Support

$TRUST tokens are the primary currency used for: - Game entry fees - Betting in matches - Purchasing in-game items - Staking for governance rights and passive income - Seasonal rewards

Multi-Currency Support: - Players can deposit various cryptocurrency types to play Trust16 - Supported currencies include but are not limited to: ETH, BTC, USDT, USDC, and APT - All non-$TRUST deposits are converted to $TRUST at current market rates for gameplay

trust-token-incentives
1.5.2 $TRUST Token Incentives

To encourage the use of $TRUST tokens, the game offers the following benefits: - 10% bonus $TRUST when depositing with $TRUST tokens - Reduced platform fees for $TRUST transactions (3% instead of 5%) - Exclusive access to certain in-game items and events

acquiring-trust-tokens

1.5.3 Acquiring $TRUST Tokens

Players can obtain $TRUST tokens through multiple methods: 1. Direct purchase on the Trust16 website 2. Swapping other cryptocurrencies for $TRUST on supported DEXes 3. Earning through gameplay and rewards 4. Participating in special events and promotions

game-economy-mechanics

1.5.4 Game Economy Mechanics

match-entry-and-fees

1. Initial Withdrawal:

   - Players looking for a match have 110 $TRUST withdrawn
   - This includes a 10% buffer for fees and potential bonuses

2. Fee Structure:

   - 5% platform fee: 5.5 $TRUST (3% for $TRUST deposits)
   - Remaining 104.5 $TRUST for gameplay

3. Round Mechanics (10 rounds):

   - Playable amount per round: 10.45 $TRUST

reward-pool

- Initialized with a seed amount (e.g., 100,000 $TRUST)

- Fed by Red-Red outcomes

- Drawn from for Green-Green bonuses

round-outcomes

For each round: - Red-Red: 20.9 $TRUST added to reward pool - Green-Red: Winning player receives 20.9 $TRUST - Green-Green: Each player receives 11.495 $TRUST (including 10% bonus)

sustainability-measures

1.5.5 Sustainability Measures

1. Dynamic Bonus Rate:

   - Bonus rates adjust based on reward pool size
   - Larger pool: Higher bonuses to encourage cooperation
   - Smaller pool: Lower bonuses to allow replenishment

2. Seasonal Resets:

   - Reward pool resets each season
   - Excess tokens used for events or burned to control inflation

3. Staking Mechanism:

   - Players can stake $TRUST for passive income
   - Staking rewards supplement the reward pool
   - Stakers receive governance rights

4. Token Burning:

   - Portion of platform fees burned
   - Controls token supply and potentially increases value

5. Tiered Gameplay:

   - Multiple stake levels (Low, Medium, High)
   - Higher stakes offer better bonuses but require more $TRUST

6. Reward Pool Protection:

   - Minimum threshold implemented
   - Bonuses reduced or suspended if threshold reached

7. Anti-Collusion Measures:

   - Algorithms detect suspicious patterns
   - Penalties for colluding accounts

sample-game-calculation

1.5.6   Sample Game

Calculation

For a 10-round game:	
Initial withdrawal	110 $TRUST
Platform fee	5.5 $TRUST (3.3 $TRUST for $TRUST deposits)
Playable amount	104.5 $TRUST (106.7 $TRUST for $TRUST deposits)

token-distribution

Assuming 6 Green-Green, 3 Green-Red, 1 Red-Red outcomes:

Outcome	Calculation	Result
Green-Green	6 * (22.99 $TRUST)	137.94 $TRUST
Green-Red	3 * (20.9 $TRUST)	62.7 $TRUST
Red-Red	1 * (20.9 $TRUST to pool)	20.9 $TRUST

Final Results

Total player payout	200.64 $TRUST
Net to reward pool	20.9 - 12.54 (bonuses) = 8.36 $TRUST

1.5.7 Token Distribution

[Note: Add specific details about the initial token distribution]
token-emission-schedule

1.5.8 Token Emission Schedule

[Note: Add details about token minting or fixed supply]
governance

1.5.9 Governance

$TRUST token holders can participate in governance decisions, including: - Adjusting bonus rates and incentives - Proposing new features or supported currencies - Voting on protocol upgrades

future-economic-considerations

1.5.10 Future Economic Considerations

1. Cross-chain Integration:

   - Explore bridging $TRUST to other blockchains for wider accessibility
   - Investigate cross-chain gameplay possibilities

2. DeFi Integration:

   - Implement yield farming opportunities for $TRUST holders
   - Explore liquidity provision incentives on DEXes

3. NFT Integration:

   - Develop NFT rewards that can be earned through gameplay or purchased with $TRUST
   - Investigate NFT-based character trait enhancements

4. Economic Simulation:

   - Regularly model and simulate the economy to ensure long-term sustainability
   - Adjust multi-currency support and incentives based on market conditions

5. Fiat On-ramp:

- Explore partnerships to allow direct fiat currency purchases of $TRUST

character-traits-system

1.6 Character Traits System

initial-trait
1.6.1 Initial Trait

- Finch: Assigned to players with fewer than 10 games. Represents those beginning their journey in the game, with potential to soar.

unlockable-traits

1.6.2 Unlockable Traits

After 10 games, players unlock one of the following 16 traits based on their play style:

1. Owl: Strategic planner with wisdom and insight

2. Fox: Clever tactician, outsmarting opponents

3. Serpent: Cunning manipulator of the game's twists

4. Dog: Trustworthy ally, standing by teammates

5. Raccoon: Opportunist, turning chaos into advantage

6. Lion: Fearless challenger, facing obstacles head-on

7. Chameleon: Adaptable player, blending with changing situations

8. Dolphin: Empathetic guide, navigating emotional waters

9. Cheetah: Quick decision-maker, seizing instant opportunities

10. Bear: Resilient endurer, standing firm against adversity

11. Wolf: Team player, thriving in cooperative environments

12. Peacock: Charismatic negotiator, excelling in social interactions

13. Elephant: Methodical and memory-driven, learning from past experiences

14. Honeybee: Industrious and community-oriented, contributing to the game's ecosystem

15. Raven: Intelligent problem-solver, finding creative solutions

16. Tiger: Bold risk-taker, not afraid to make daring moves

trait-impact

1.6.3 Trait Impact

- Traits are visible to opponents before and during matches

- They provide insight into a player's likely strategy and behavior

- Traits may influence matchmaking to create diverse and interesting game dynamics

- Future updates may introduce trait-specific bonuses or challenges

trait-stability-and-progression

1.6.4 Trait Stability and Progression

Trust16 implements a trait stability system to reflect player experience and trait reliability:

1. Novice (10-24 games):

   - Initial trait unveiled
   - Represented by a black and white trait icon
   - Trait reassessed every 5 games

2. Adept (25-99 games):

   - Trait gains partial coloration
   - Reassessed every 10 games
   - Increased accuracy in trait prediction

3. Master (100+ games):

   - Fully colored trait icon
   - Trait reassessed every 25 games
   - Highest stability and prediction accuracy

This system provides visual feedback on player progression and trait reliability, encouraging long-term engagement while allowing for early trait assignment.

trait-prediction-system

1.7 Trait Prediction System

Trust16 employs a quantitative trait prediction system to analyze player behavior and assign the most probable character trait. This system uses a player's recent game history to calculate a trait score, allowing for dynamic trait assignment and strategic depth.

trait-behavior-encoding

1.7.1 Trait Behavior Encoding

Each trait is encoded with three behavioral indicators: - IC (Initial Cooperation): {0, 1, -} - RC (Response to Cooperation): {0, 1, -} - RT (Response to Competition): {0, 1, -}

Where: - 0 represents competition - 1 represents cooperation - - represents a variable or adaptive response

1.7.2 Trait Prediction Algorithm

Variables: - n: number of moves in the analyzed sequence - M = {m, m, . . ., m}: sequence of player moves, where m $\in$ {0, 1} - T: set of all traits - For each trait t $\in$ T: IC(t), RC(t), RT(t) $\in$ {0, 1, -}

Scoring Algorithm:

1. Initial Cooperation Score: S_IC(t) = { 1, if IC(t) = m or IC(t) = - 0, otherwise }

2. Move Matching Score: S_M(t) = $\sum$ f(m, m, t)

   Where f(m, m, t) = { 1, if (m = 1 and (m = RC(t) or RC(t) = -)) or (m = 0 and (m = RT(t) or RT(t) = -)) 0, otherwise }

3. Total Score: S_total(t) = (S_IC(t) + S_M(t)) / n

4. Trait Prediction: Predicted Trait = argmax_t S_total(t)

5. Confidence Score: C(t) = S_total(t) * 100%

1.7.3 Trait Ranking and Selection

Traits are ranked by their S_total(t) values in descending order. The top k traits (e.g., k = 3) are selected as the most probable traits for the player.

Top_k_traits = {t, t, . . ., t | S_total(t) $\geq$ S_total(t) for all j > i}

1.7.4 7.4 Example Application

Consider two players with the following 10-move sequences:

Player 1: 1, 0, 1, 1, 1, 1, 1, 1, 1, 1 Player 2: 1, 1, 0, 1, 1, 1, 1, 1, 1, 0

Applying the trait prediction algorithm:

Player 1: - Cooperation Rate: 90% - Top 3 predicted traits: 1. Dog (Score: 10/10, Confidence: 100%) 2. Honeybee (Score: 9/10, Confidence: 90%) 3. Bear (Score: 8/10, Confidence: 80%)

Player 2: - Cooperation Rate: 80% - Top 3 predicted traits: 1. Owl (Score: 9/10, Confidence: 90%) 2. Dolphin (Score: 8/10, Confidence: 80%) 3. Wolf (Score: 8/10, Confidence: 80%)

1.7.5 System Limitations and Future Improvements

The current trait prediction system has several limitations: 1. It assumes equal weight for all moves in the sequence. 2. It does not account for the opponent's moves or game context. 3. It may struggle with highly adaptive or complex strategies.

Future improvements may include: 1. Weighted scoring based on move recency or game phase. 2. Incorporation of opponent moves and game context in the analysis. 3. Machine learning algorithms for more sophisticated pattern recognition. 4. Longer-term player history analysis for more accurate trait prediction.

1.8 Seasonal Play

1.8.1 Structure

- Seasons last for one month.

- Each season has a unique theme or challenge.

- Leaderboards track various performance metrics.

rewards

1.8.2 Rewards

- Exclusive seasonal NFTs

- $TRUST token rewards

- Special in-game titles or badges

seasonal-challenges

1.8.3 Seasonal Challenges

- Unique gameplay modifiers each season

- Special trait-based missions or objectives

- Community-wide cooperative goals

ai-bot-mode

1.9 AI Bot Mode

purpose
1.9.1 Purpose

- Practice mode for new players

- Available when human opponents are scarce

- Helps maintain game liquidity

ai-implementation

1.9.2 AI Implementation

- Multiple difficulty levels

- Machine learning algorithms to mimic human play styles

- Regular updates to improve AI behavior

bot-personalities

1.9.3 Bot Personalities

- AI bots designed to emulate different trait behaviors

- Provides players experience with various strategies

serving-the-public-good

1.10 Serving the Public Good

Trust16 is designed not only as an entertaining game but also as a platform to contribute to the public good. Through its unique mechanics and data collection capabilities, Trust16 aims to make positive impacts in several areas:

educational-tool

1.10.1 Educational Tool

- Teaches game theory concepts interactively

- Demonstrates the importance of trust and cooperation

- Illustrates complex decision-making in strategic situations

research-platform

1.10.2 Research Platform

- Provides a controlled environment for studying human behavior at scale

- Generates valuable data for social scientists, economists, and psychologists

- Facilitates cross-cultural studies on trust and cooperation

skill-development

1.10.3 Skill Development

- Improves players' negotiation and communication skills

- Enhances strategic thinking and decision-making abilities

- Develops emotional intelligence through interpreting others' intentions

social-awareness

1.10.4 Social Awareness

- Highlights the impact of trust and mistrust in society

- Raises awareness about the importance of cooperation in solving global challenges

- Demonstrates how individual actions affect collective outcomes

data-collection-for-social-good

1.10.5 Data Collection for Social Good

Trust16 will collect and analyze various statistics that can provide valuable insights:

1. Cooperation rates across different player traits and regions

2. Trust dynamics and the impact of communication

3. Economic behavior related to bet sizes and risk-taking

4. Decision-making patterns under various pressures

5. Group dynamics and the effect of individual traits on team performance

6. Learning and adaptation strategies over time

7. Reputation effects and their impact on gameplay

8. Patterns of forgiveness and retaliation

9. Ethical decision-making when personal and group benefits conflict

ethical-considerations-and-data-usage

1.10.6 Ethical Considerations and Data Usage

To ensure that Trust16 serves the public good responsibly:

1. All data collection will be transparent and consensual

2. Player data will be anonymized to protect privacy

3. Collaborations with academic institutions will ensure rigorous analysis

4. Findings will be published in open-access formats

5. Ethical implications of research and its applications will be carefully considered

future-roadmap

1.11 Future Roadmap

Phase 1 (Launch): - Core game mechanics implementation - Basic trait system deployment - Initial smart contract deployment on Aptos network

Phase 2 (Expansion): - Introduction of $TRUST token and multi-currency support - Seasonal play implementation - Enhanced AI bot mode with trait-based personalities

Phase 3 (Ecosystem Growth): - Governance model for $TRUST holders - Tournament mode with significant prizes - Partnerships with other blockchain projects and academic institutions

Phase 4 (Research Integration): - Collaboration with academic institutions for game theory research - Publication of anonymized game data for scientific study - Development of educational resources based on Trust16 insights

Phase 5 (Advanced Features): - Cross-chain gameplay possibilities - Enhanced NFT integration with trait-based collectibles - Advanced DeFi features for $TRUST holders

conclusion

1.12 Conclusion

Trust16 represents a pioneering effort in blockchain gaming, blending sophisticated game theory with cutting-edge technology. By creating a platform that is simultaneously a game, a social experiment, and a research tool, Trust16 aims to push the boundaries of what's possible in the realm of decentralized applications.

The game's unique features, including its 16 character traits, multi-currency support, and trait stability system, provide a rich and engaging player experience. At the same time, the focus on data collection and analysis for social good positions Trust16 as more than just a game—it's a potential catalyst for understanding and improving human cooperation and trust dynamics.

As we move forward, we invite players, developers, researchers, and institutions to join us in exploring the fascinating world of Trust16. Together, we can not only enjoy a compelling

game but also contribute to meaningful insights that could shape our understanding of human behavior and social interactions in the digital age.

The future of Trust16 is bright, with plans for continuous improvement, expansion, and integration with the broader blockchain and research communities. We're excited to embark on this journey of discovery, entertainment, and social impact with our growing community of players and partners.