

# Trust16: A Blockchain-Based Game of Strategy and Cooperation

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## 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 and seasonal changes, 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 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 that evolve seasonally, a sophisticated prediction system, seasonal play, and an AI bot mode, offering a rich, multifaceted gaming experience. Trust16's native \$TRUST token forms the core of its economy, with a carefully designed tokenomics model that balances accessibility, engagement, and long-term sustainability.

Beyond its entertainment value, Trust16 serves as a powerful tool for research and social good, offering insights into human behavior, decision-making processes, and the dynamics of trust in a controlled, blockchain-powered environment.

## 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.

## 3 Game Mechanics

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

### 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

### 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

### 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

### 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

## 4 Technical Architecture

### 4.1 Blockchain Integration

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

### 4.2 Smart Contract

The core smart contract handles:

- Player matching
- Bet escrow
- Outcome verification
- Reward distribution

### 4.3 Cryptographic Fairness

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

### 4.4 Frontend

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

## 5 Tokenomics and Game Economy

Trust16's economy is designed to be flexible, sustainable, and engaging, incentivizing both co-operation and strategic gameplay. The native token, \$TRUST, is the exclusive currency used within the game ecosystem.

### 5.1 Token Utility

\$TRUST tokens are used exclusively for:

- Game entry and betting in matches
- Purchasing in-game items and NFTs
- Seasonal rewards

### 5.2 Acquiring \$TRUST Tokens

Players can obtain \$TRUST tokens through:

1. Direct purchase on the Trust16 website
2. Earning through gameplay and rewards
3. Participating in special events and promotions

### 5.3 Game Economy Mechanics

- No fees are deducted upon game start, maximizing the playable amount
- The rewards pool can be increased by minting new tokens as needed
- Users cannot trade \$TRUST tokens directly, but can use them to purchase tradeable NFTs

### 5.4 Sustainability Measures

1. Dynamic Reward Pool:
  - The ability to mint tokens allows for flexible management of the reward pool
  - Careful monitoring and adjustment to maintain economic balance
2. NFT Marketplace:
  - Tradeable NFTs provide an indirect way for players to extract value
  - NFT rarity and utility carefully designed to drive demand for \$TRUST

3. Controlled Token Supply:

- Strategic minting and burning of tokens to manage inflation
- Regular economic simulations to ensure long-term sustainability

## 5.5 Future Economic Considerations

1. Enhanced NFT Ecosystem:

- Expand the range and utility of purchasable NFTs
- Implement NFT staking or farming mechanisms

2. Governance Integration:

- Explore governance rights for long-term players or high-value NFT holders
- Community input on economic policies and game features

3. Cross-game Partnerships:

- Investigate partnerships with other blockchain games for NFT interoperability
- Explore cross-game events or challenges

## 6 Character Traits System

Trust16 features a dynamic character trait system that adds depth to gameplay and encourages strategic adaptation. The system combines stable core traits with seasonal variations to keep the game fresh and engaging.

### 6.1 Core Traits

The game maintains 16 standard character traits:

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

## 6.2 Seasonal Trait Variations

To keep the game dynamic and encourage strategic adaptation:

- Each season, 4-6 characters receive significant trait changes or "seasonal variants"
- Seasonal variants feature visual changes (themed skins) and adjusted trait behaviors
- Remaining characters receive minor trait tweaks to keep the meta fresh
- Occasional introduction of new characters (yearly) with potential retirement of underperforming ones

## 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 influence matchmaking to create diverse and interesting game dynamics
- Seasonal variations encourage players to adapt strategies and explore new playstyles

## 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 strategic depth through seasonal variations.

## 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.

### 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

### 7.2 Trait Prediction Algorithm

Variables:

- $n$ : number of moves in the analyzed sequence
- $M = \{m_1, m_2, \dots, m_n\}$ : sequence of player moves, where  $m_i \in \{0, 1\}$
- $T$ : 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:  $S_{IC}(t) = \begin{cases} 1, & \text{if } IC(t) = m_1 \text{ or } IC(t) = - \\ 0, & \text{otherwise} \end{cases}$
2. Move Matching Score:  $S_M(t) = f(m_1, m_2, t)$   
Where  $f(m_1, m_2, t) = \begin{cases} 1, & \text{if } (m_1 = 1 \text{ and } (m_2 = RC(t) \text{ or } RC(t) = -)) \text{ or } (m_1 = 0 \text{ and } (m_2 = RT(t) \text{ or } RT(t) = -)) \\ 0, & \text{otherwise} \end{cases}$
3. Total Score:  $S_{total}(t) = (S_{IC}(t) + S_M(t)) / n$
4. Trait Prediction: Predicted Trait =  $\text{argmax}_t S_{total}(t)$
5. Confidence Score:  $C(t) = S_{total}(t) * 100\%$

### 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.

$\text{Top}_k\text{-traits} = \{t_1, t_2, \dots, t_k \mid S_{total}(t_j) \geq S_{total}(t_i) \text{ for all } j \leq i\}$



## 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%)

## 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.

# 8 Seasonal Play

## 8.1 Structure

- Seasons last for one month.
- Each season has a unique theme or challenge.
- Leaderboards track various performance metrics.

## 8.2 Rewards

- Exclusive seasonal NFTs
- \$TRUST token rewards
- Special in-game titles or badges

## 8.3 Seasonal Challenges

- Unique gameplay modifiers each season
- Special trait-based missions or objectives
- Community-wide cooperative goals

# 9 AI Bot Mode

## 9.1 Purpose

- Practice mode for new players
- Available when human opponents are scarce
- Helps maintain game liquidity

## 9.2 AI Implementation

- Multiple difficulty levels
- Machine learning algorithms to mimic human play styles
- Regular updates to improve AI behavior

## 9.3 Bot Personalities

- AI bots designed to emulate different trait behaviors
- Provides players experience with various strategies

# 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:

## 10.1 Educational Tool

- Teaches game theory concepts interactively
- Demonstrates the importance of trust and cooperation
- Illustrates complex decision-making in strategic situations

## **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

## **10.3 Skill Development**

- Improves players' negotiation and communication skills
- Enhances strategic thinking and decision-making abilities
- Develops emotional intelligence through interpreting others' intentions

## **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

## **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

## **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

## 11 Future Roadmap

The development and expansion of Trust16 is planned in several phases:

### 11.1 Phase 1 (Launch)

- Core game mechanics implementation
- Basic trait system deployment
- Initial smart contract deployment on Aptos network

### 11.2 Phase 2 (Expansion)

- Introduction of \$TRUST token and economic model
- Seasonal play implementation
- Enhanced AI bot mode with trait-based personalities

### 11.3 Phase 3 (Ecosystem Growth)

- NFT marketplace integration
- Tournament mode with significant prizes
- Partnerships with other blockchain projects and academic institutions

### 11.4 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

### 11.5 Phase 5 (Advanced Features)

- Cross-chain gameplay possibilities
- Enhanced NFT integration with trait-based collectibles
- Exploration of governance mechanisms for long-term players

## 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 dynamic character traits, sophisticated tokenomics, and seasonal play 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.