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CSC307 - BLOCKCHAIN ARCHITECTURE AND DESIGN

CA-III

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Topic Allocated - Question 01

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Report on a Basic Decentralized Marketplace Smart Contract

Introduction

This report outlines a Solidity smart contract function for a decentralized marketplace. The function enables sellers to list items for sale and buyers to purchase those items securely. The function ensures the transaction follows the required checks, ensuring the buyer pays the exact price set by the seller, and ownership is transferred only upon successful payment.

Requirements

1. **Seller Features:**
 - Sellers can list items for sale.
 - Sellers set a price for their items.
2. **Buyer Features:**
 - Buyers can purchase items by paying the exact specified price.
 - Ownership of the item is transferred to the buyer upon successful payment.
3. **Security and Validations:**
 - Prevent underpayments or overpayments.
 - Ensure the ownership of the item is updated only after payment is complete.

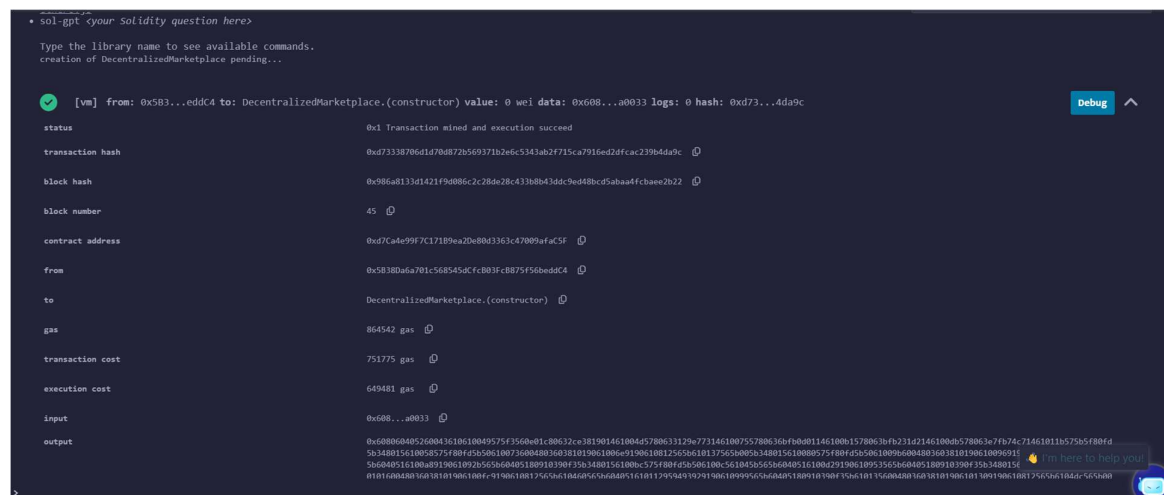
Advantages of the Decentralized Marketplace Smart Contract

1. **Transparency:**
 - All transactions and ownership changes are recorded on the blockchain, ensuring a transparent and immutable history.
2. **Security:**
 - The contract enforces strict validations, such as checking exact payments and preventing unauthorized access, reducing fraud and disputes.
3. **No Middleman:**
 - Unlike centralized platforms, there is no need for intermediaries, leading to lower transaction fees and direct interactions between buyers and sellers.
4. **Global Access:**
 - The marketplace is accessible globally, allowing anyone with internet access and a crypto wallet to participate.
5. **Automation:**
 - Smart contracts automatically handle payments, ownership transfers, and status updates, reducing human error and ensuring reliability.

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1. **Struct Definition:**
 - `Item` struct holds details about each item: ID, seller's address, buyer's address, price, and whether it's sold.
2. **Mapping:**
 - `items` maps an item ID to its details for easy retrieval.
3. **Listing an Item (`listItem`):**
 - Sellers call this function, providing a price.
 - The function ensures the price is valid and assigns a unique ID to the item.
4. **Buying an Item (`buyItem`):**
 - Buyers call this function with the item ID and the exact payment.
 - Validations ensure the item exists, the correct price is paid, and the item is not already sold.
 - Funds are transferred to the seller, and the buyer is recorded as the new owner.
5. **Events:**
 - `ItemListed` and `ItemPurchased` provide transparency and allow frontend developers to listen for updates.

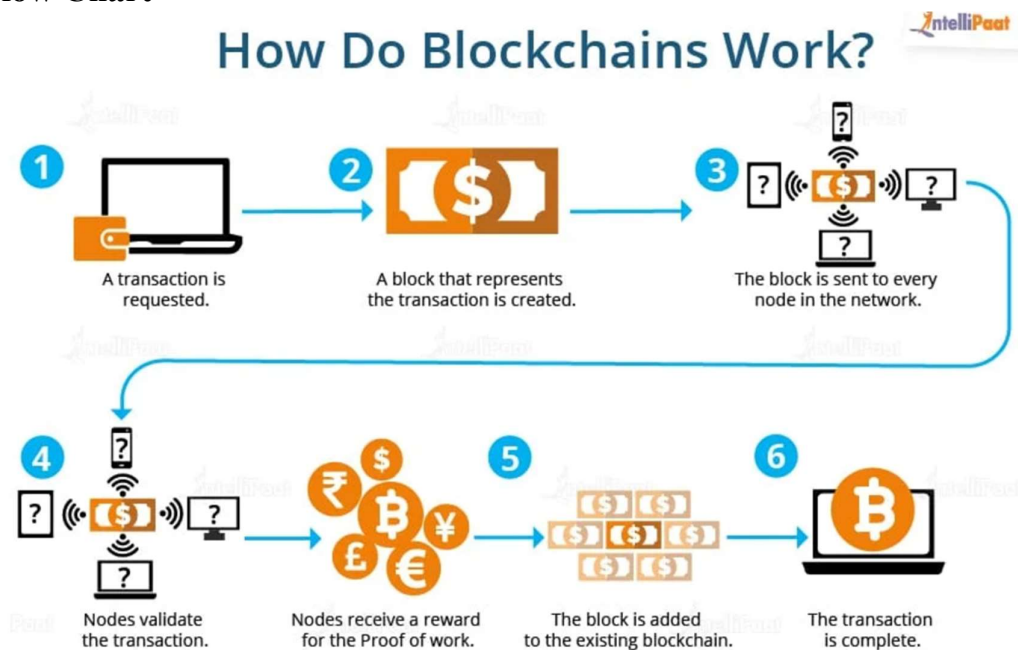
Testing and Deployment

- Testing:
 - Use frameworks like Hardhat or Truffle to test various scenarios:
 - Valid transactions.
 - Invalid price payments.
 - Unauthorized ownership updates.
- Deployment:
 - Deploy the contract to a test network like Goerli or Mumbai before deploying to the main net.

Uses of the Code

1. **Peer-to-Peer Trading:** Direct buying and selling of goods or services without intermediaries.
2. **Digital Asset Marketplaces:** Secure trading of NFTs, game items, or media files with automated ownership transfer.
3. **Supply Chain Transactions:** Transparent and tamper-proof trade between suppliers and buyers.
4. **Decentralized E-commerce:** Crypto-based platforms for selling physical or digital goods globally.
5. **Tokenized Real Estate:** Simplifies property ownership transfers and enables fractional ownership.
6. **Auction Systems:** Basis for decentralized auctions with automated payments and ownership updates.

Flow Chart



Conclusion

The decentralized marketplace smart contract demonstrates the power of blockchain technology in creating transparent, secure, and efficient trading platforms. By automating essential processes like payment handling and ownership transfer, it eliminates the need for intermediaries, reduces transaction costs, and ensures trust between participants. Its flexibility allows adaptation for various use cases, including peer-to-peer trading, digital asset marketplaces, supply chain management, and decentralized e-commerce. Overall, the contract offers a scalable and reliable foundation for modern, blockchain-powered commerce.

References

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