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Smart Contract-Based Decentralized Rental System for Housing

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Abstract: ***Blockchain is the kind of innovation that was presented to the world a long time ago with the offer assistance of a few cryptocurrencies, but as in the assist investigate done by individuals, world realized blockchain can be utilized in for diverse purposes to make framework more secure with the offer assistance of legitimate computer program and innovation we can make anything much secure and decentralized same can be utilized in house rental framework.***
Keywords: Internet, Technology, Safety, Blockchain, Smart contract, Decentralized, Real Estate.

I. INTRODUCTION

The Assignment of the rooms in lodgings and houses was conceivable in the world which was obscure with the blockchain and square chain is a commonly passed ledger(record) in which trades are intentioned recorded and related together with an objective to convey a entirety history of an trade by a thing designer's point of see. Genuine veritable space is going to offer assistance the world to get ready the more astute and secure rental framework. The enhancement of sharp cities, communities are publicizing an facilitates trade into the city making plans with day-to-day utilization. The Headway of development [1] advances nearness in utilization of piece chain development. Square chain is Decentralized and distributive in nature the entire diagram work depends on these two components. Other than, the changelessness layoutwork guarantees that there is no degree of altering as any and each exchange that has been recorded has been done so, for all time. We have a orchestrate system for the brilliant understanding which empowers movements of distinctive utilize case utilizing Piece chain advancement [2]. A state of obliged capacities and techniques are depicted for a particular utilize case giving basic commitments to lands space. Right by and by, square chain gets to be the most influencing headway for paperless city exchanges with a secure environment on a idealize organization of Sharp contract focal points. The adroit contracts grant a secured, circulated and shared decentralized record everything being break even with and exchanges among proprietor and tenants. Permitting inhabitants to discover the room they adore or lodgings they adore or bear. This can be taken as the presentation of entire unused web that can too be called as web3. As we talked about prior that there will be utilize of robustness which is important.
Smart contracts will work as the book of rules which are to be followed.

II. LITERATURE REVIEW

Blockchain (Yuan, 2016) is a modern decentralized framework and conveyed computing worldview that has risen with the expanding ubiquity of advanced cryptocurrencies such as Bitcoin (Nakamoto, 2009). It has the capacity to dispose of grinding and diminish hazard (Kim, 2018), whereas too constraining the capacity to recover or cancel exchanges (Kim, 2018). Peer-to-peer conveyed arrange records the open history of exchanges. Ethereum (2015) has gotten to be the moment biggest blockchain stage after Bitcoin. It has all the highlights of the blockchain and has created Turing's total EVM (Ethereum virtual machine) (Wood, 2014). Clients can construct subjectively complex and accurately characterized shrewd contracts and decentralized applications based on Ethereum, it is called DApp (Decentralized Application) (David, 2015).
The keen contract is a computerized exchanging understanding that upholds contract terms (Kim, 2018). It deciphers contract terms into code and inserts them into self-enforcing assets, minimizing the require for trusted mediators between exchanges, as well as noxious or coincidental events (Cong, 2018). The shrewd contract is a self-executing script that dwells on a blockchain. Each hub in the blockchain that empowers savvy contracts runs a virtual machine (VM). Blockchain organize acts as a conveyed VM. The shrewd contracts work as independent performing artists and their conduct is totally unsurprising.

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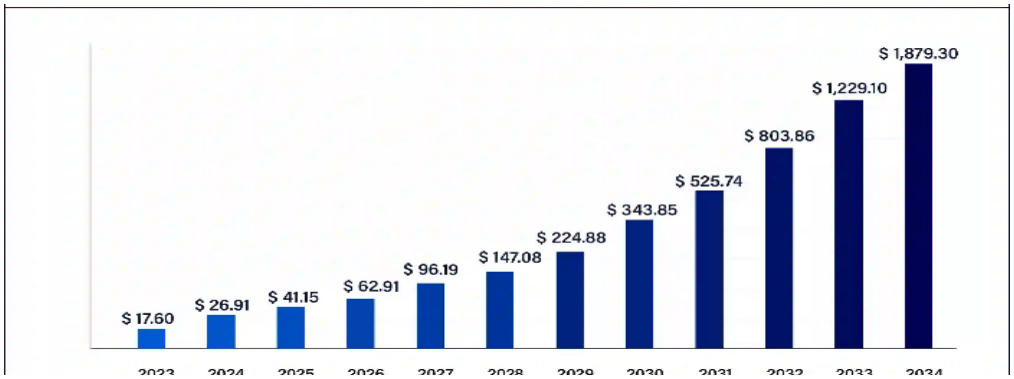
III. PROPOSED METHODOLOGY

1) Solidity

That That reliability is an object- acquainted, high- position language for enforcing smart contracts. Smart contracts are programs that govern the geste of accounts within the Ethereum state. reliability is a curled- type language designed to target the Ethereum Virtual Machine (EVM). It's told by C, Python, and JavaScript. You can find further details about which languages reliability has been inspired by in the language influences section. reliability is statically compartmented, supports heritage, libraries, and complex stoner- defined types, among other features. With reliability, you can produce contracts for uses similar as voting, crowdfunding, eyeless deals, andmulti-signature holdalls. When planting contracts, you should use the rearmost released interpretation of reliability. piecemeal from exceptional cases, only the rearmost interpretation receives security fixes. likewise, breaking changes, as well as new features, are introduced regularly.

2) Blockchain

It is decentralized/not centralized technology i.e. does not have database or save dataon one single server database is distributed all over the blockchain among the millions and billions of the nodes. customer operations of affiliated businesses can read or tack sale records to the blockchain. sale records submitted to any knot are validated and committed to the tally database on all the bumps of blockchain network. Married deals are inflexible because each block is linked with its former block by means of hash and hand values. Protocols similar as Gossip and Consensus insure that the submitted deals are transferred to all bumps and committed on all blockchain bumps constantly. As shown in Figure 1, blockchain ecosystem consists of blockchain customer, blockchain knot, blockchain network, sale processor and agreement process. Blockchain customer is an operation that creates sale communication in a specified format and submits it to blockchain knot through web API. It may be any being operation, which posts sale communication to blockchain knot. guests are confined using Public Key structure(PKI) technology at blockchain knot position. The Blockchain knot is a garçon knot that runs blockchain services responsible for entering the sale and transmits the sale to other blockchain bumps. With respect to the design, the knot participates in agreement process to commit the block of sales data to tally database[7].



Graph.1. Growth of blockchain market (in Billions) [10]

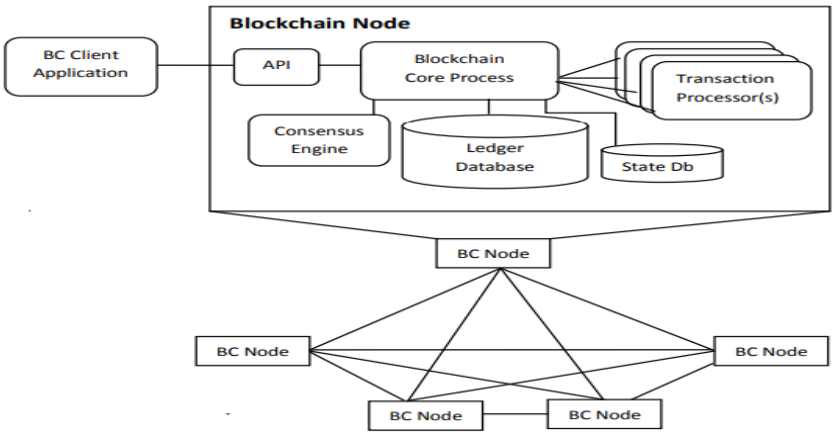


Fig.1. Blockchain ecosystem [4]

3) Ethereum

Ethereum is the digital currency but in the case of house rental system we are not only going to use this in for transaction but also as gas fees for blockchain. As in this work we are going to use blockchain which is based on the Ethereum which means it will give us the security and we will pay it with the Ethereum this is the process how blockchain works in. We need to pay to use the blockchain. In the case of payment, we should also have the Ethereum wallet which we will further connect to the blockchain and website which makes it easy to accept and deny the request of transaction at every time instance.

4) MetaMask

MetaMask is utility or wallet which is required to keep and use our currency aka gas fees it helps to make it easy to use and store Ethereum. In general, MetaMask is a basic component of a blockchain-based decentralized house rental system. It provides a user-friendly interface for association with the Ethereum organize and its keen contracts, and enables secure and consistent exchanges utilizing cryptocurrencies [9].

5) Hardhat

Hardhat is the development environment for Ethereum and smart contract i.e. we can write and deploy smart contract. Deploying is just the process of setting the smart contract on the blockchain.

6) Architecture

Architecture of our system is full of crucial process. The architecture that we have made or used to make the working much smoother and easy. Website consists of some authentication, creation, booking, etc. processes. First of all, it is important to state that website is made for owner and tenants both so each user has to go through the authentication process. Verification process has to be done at every time instance and step which is the main difference between decentralized system and centralized system.

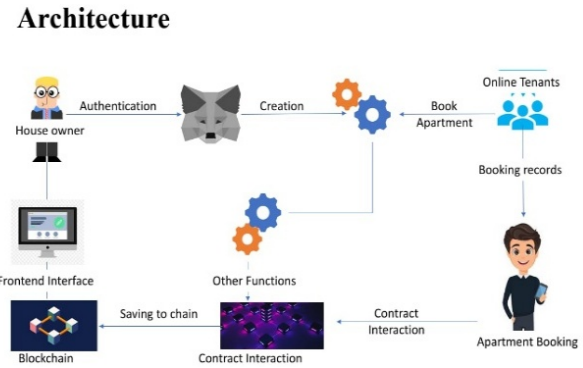


Fig.2.Architecture

a) Authentication: As we have talked about the nature of the website is dual i.e. For owner and tenants to identify the nature of the user we authentication process is very important.

*b) Wallet creation:*As we have talked about decentralized technology before we know that for using blockchain we need a wallet and wallet also a medium of the authentication.

c) Apartment Booking/renting:After authentication tenant can book apartment or owner can rent apartment.

d) Contract interaction: Each step in the process result in some interaction with contract.

e) Saving to chain: As the user has Done authentication and done renting and booking of the apartment/room through the frontend interface blockchain has to save the process to its blocks so it will go smoothly further without any difficulties. As we have already deployed smart contract on the blockchain it will as we written in the contract e.g. Only the owner can create, delete, and update the room/house also we have stated in the contract that the refund amount will be refunded to the tenant excluding security fee(security fee is the concept which helps local owner to avoid scams) which is 5% of the price of the room/house for example I am a tenant who has house out on website at 30000rs/day if someone wants refund after booking, the amount that will be refunded will be 28500rs.

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IV. IMPLEMENTATION

Decentralized house rental system is the process which is supposed to work properly at any instance for keep it working smoothly and keep it handy the easy GUI is very important if GUI is complex then it will be very difficult for normal or new user to use. To keep GUI simple and attractive we have used some programming languages and scripting languages. As we talked about smart contract before we have used solidity in it but to make website or GUI only solidity is not enough, we have to use some scripting languages like JavaScript also for the sake of designing we have to use some frameworks like Tailwind CSS, utility-first approach and unraveled CSS surrender are the crucial reasons for its critical influence on web application speed. Tailwind CSS diminishes inconsequential CSS rules by particularly counting utility classes to HTML components, making the stylesheet basically smaller. Web applications perform way superior and stack pages more quickly as a result of this record degree lessen [5]. In this work we have also implemented some image input. In this decentralized house rental project, we have to make it work similar to the other websites out in the market i.e. same process to rent or book the room. But all the change happens when we connect whole system with the blockchain and make it decentralized.

In the whole process of development, we have no need to connect the database with website if we connect it anyway that will be the conflict of interest means system won't be decentralized anymore hence there was no use of database related techniques/technologies in whole process because all processes are getting saved in blockchain automatically.

Smart contract is most important component of whole process we have defined some rules in smart contract for booking and renting the apartment, booking apartment, review, refunding, deleting, updating and renaming apartment. Some rules are like price should be more than 0, refunding must be don't within the given date i.e. if refunding is only applicable before 7 days of booking on the 8th day it is not possible to get your money back in the worst case you need to contact owner directly. Owners contact details will also be given on the page of booking.

Our whole process is also connected with the real time which also helps in keeping the records.

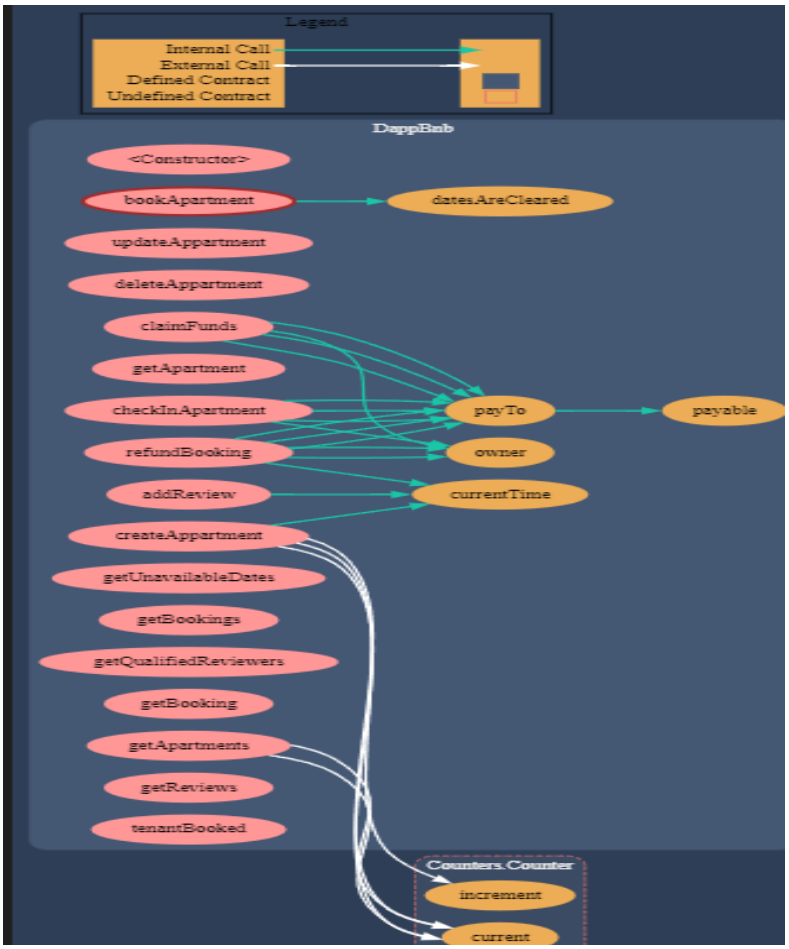


Fig.3.Visualtization of smart contract

In the flowchart above we have tried to make visualization of smart contract developed by us usingSolidity Visual Developer by ConsensysDiligence. [7]

V. RESULT AND DISCUSSION

Decentralized house rental system is not only secure but also advanced and easy to use project. In this project we have used different frameworks and languages as we have discussed before user of different languages helps to keep system smooth and fine which is very important for user with nor understanding of internet. Use of different frameworks helps us to create the attractive website that looks and works smooth. All the technologies and techniques that we have used results in the beautiful secure and smooth interface. We are going to discuss about it in this section.

Let's learn about our decentralized in more details using some images of website. In this section we are going to see how system works with the help of images and figures.

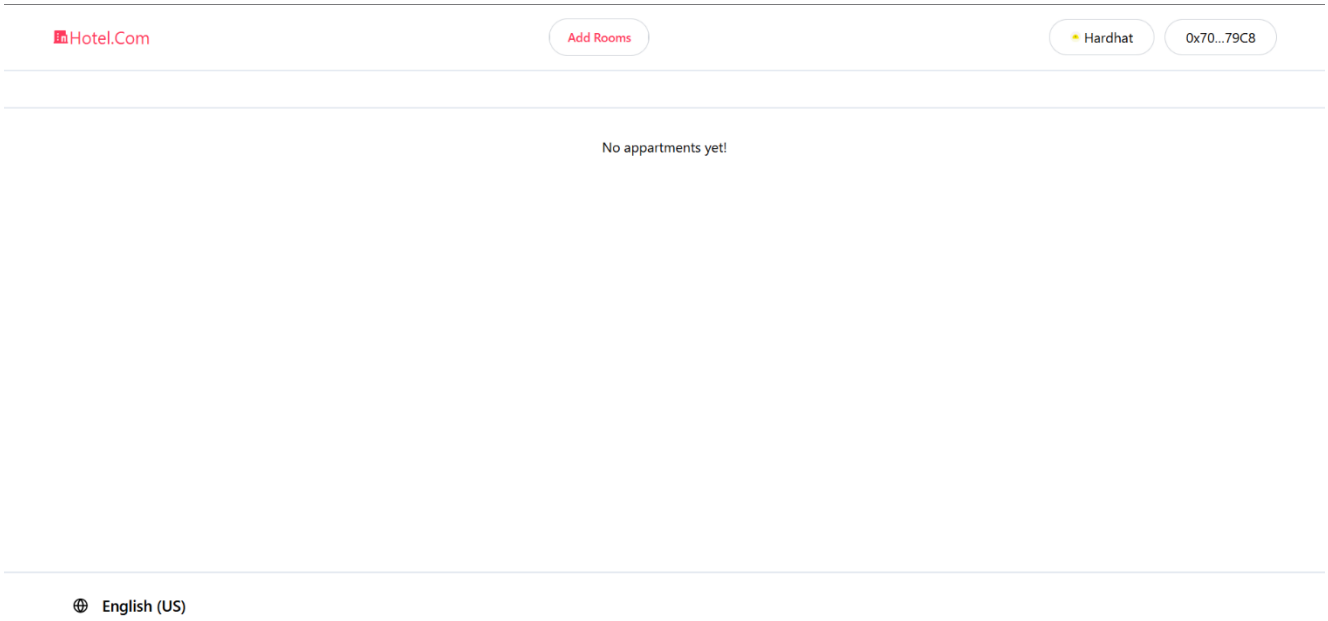


Fig.4. Frontend of the website(Without any input)

In the Fig.4. given above is the image of website without any input as we can see in the upper right corner there is number written which is nothing but the wallet address of the user and Hardhat written next to it is development environment. And there is action menu (Add rooms, Anywhere, Any week).

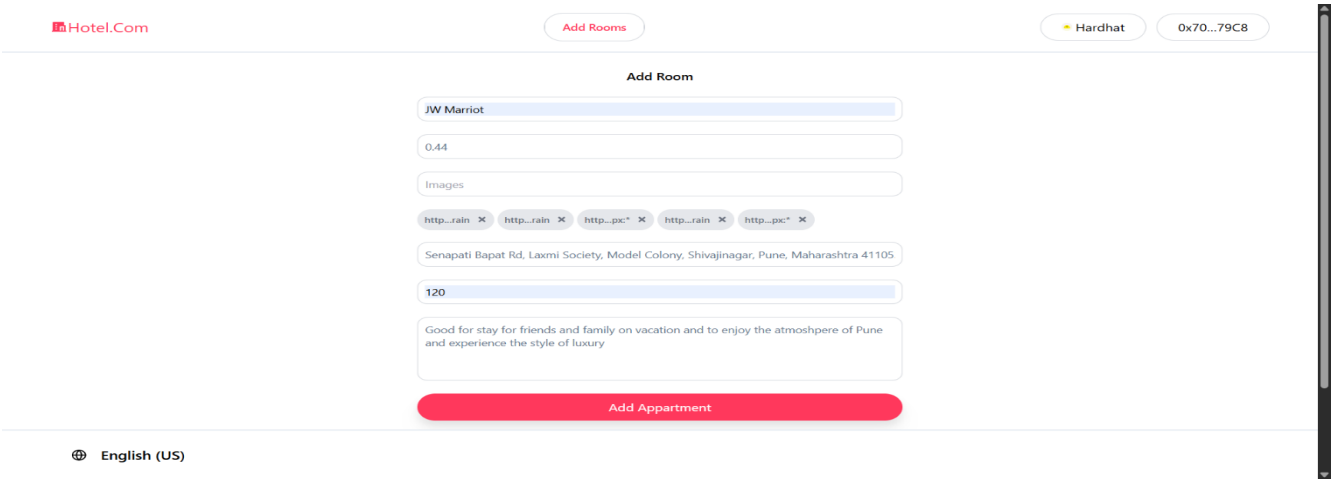


Fig.5.Option for adding room details

As we can see in the Fig.5. we have page to add details of rooms which opens after we select option of add rooms. We are adding details that means we are the owner of the room. Some options to add detail is provided e.g. Room name, Price (in Ethereum), images of room for customer to make choice whether room is nice or not (Images are need to be inserted in the JPG format only), Location in detail, number of rooms, Room descriptions, etc. After adding all the details in provided tab owner need to choose the option given below (Add apartment). As we can see the buttons that we have provided look very easy to use and whole website looks attractive all thanks to tailwind CSS and other framework languages used.

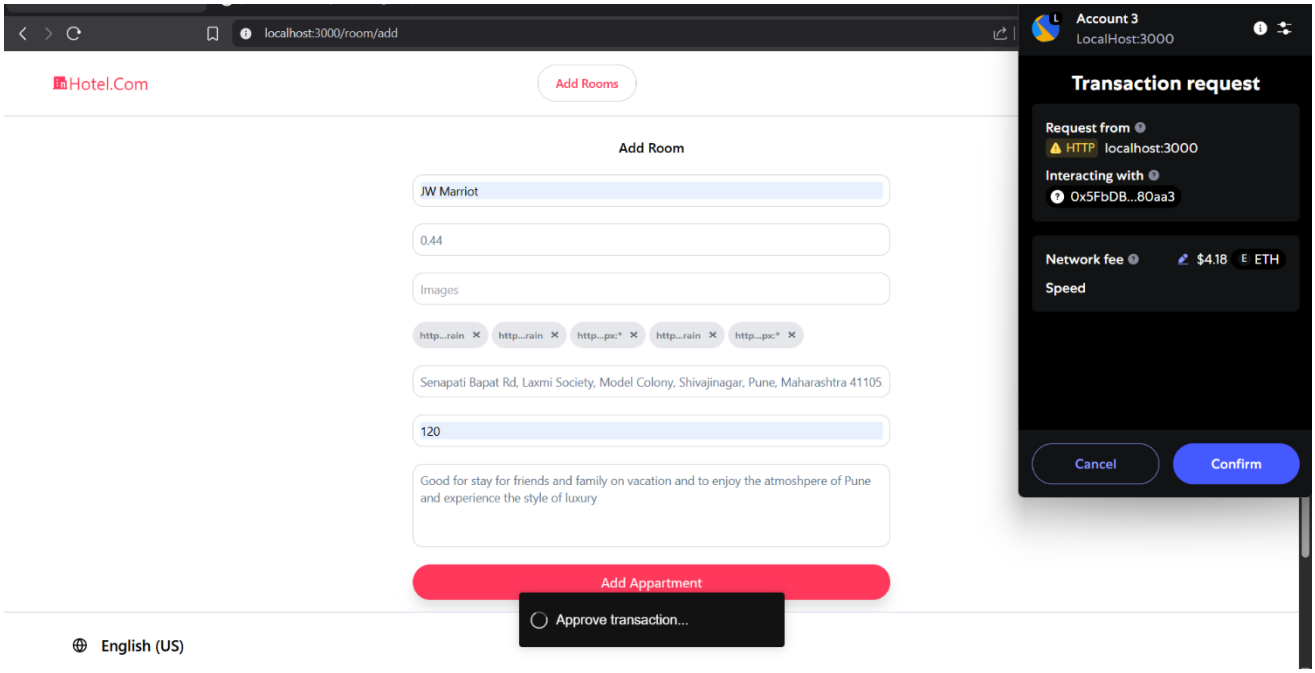
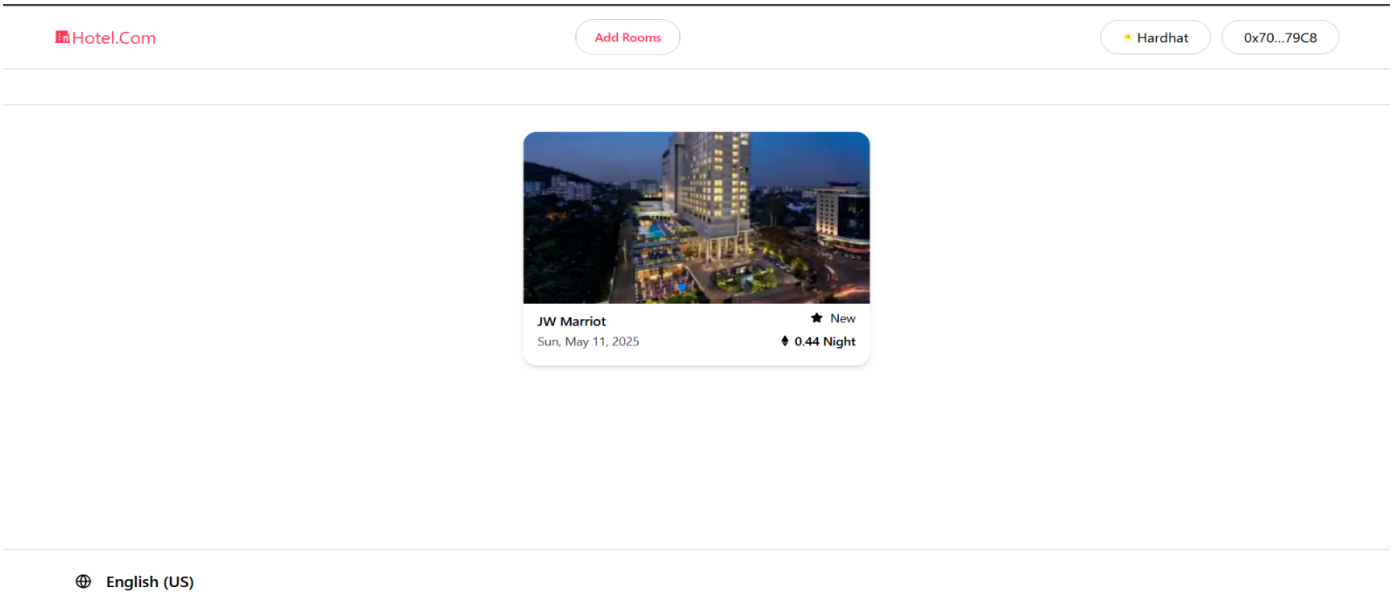


Fig.6.Verification request

As we have talked about how secure blockchain based systems are in fact this verification process makes it secure every little step we perform in this whole project we need to verify it and by this verification process we need to pay some gas fees which helps to keep it in the blockchain. As we can see in Fig.6. we have transaction request form localhost3000 and Network fee is 3.00 by choosing confirm option our room will be created and will be saved on blockchain



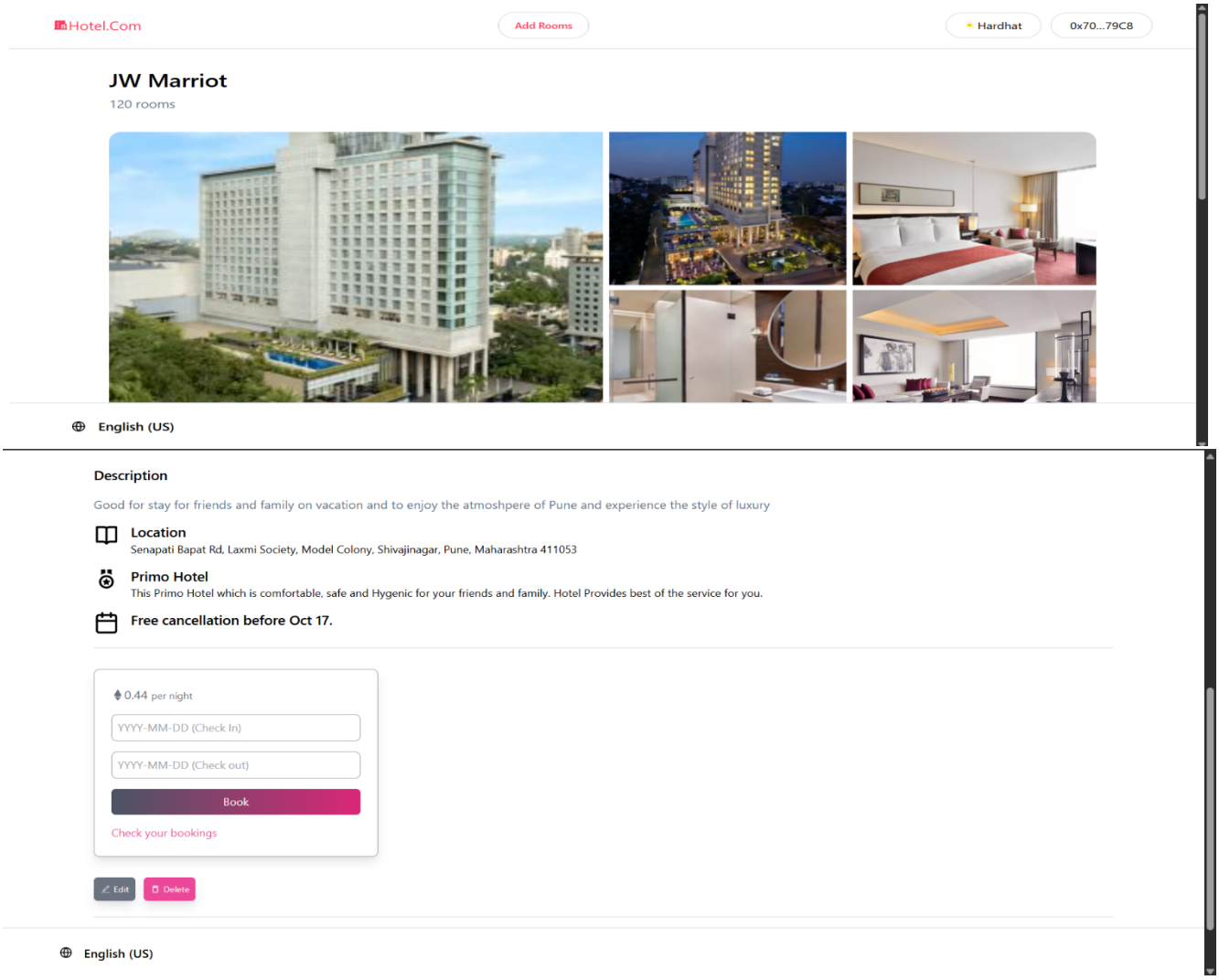
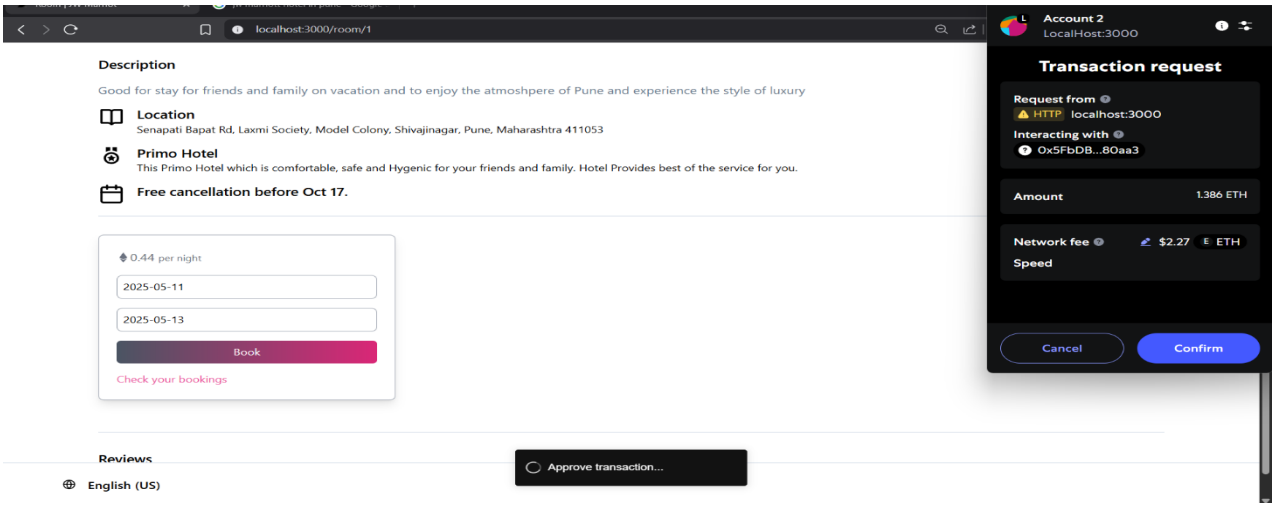


Fig.7.Created room by owner (Combination of three images)

As we can see there is representation of room and its details very beautifully and some options are also given which we have discussed previously. Main attraction is there is option of 'Deletion and Updating the room' which is only possible by owner (one who has created the room).



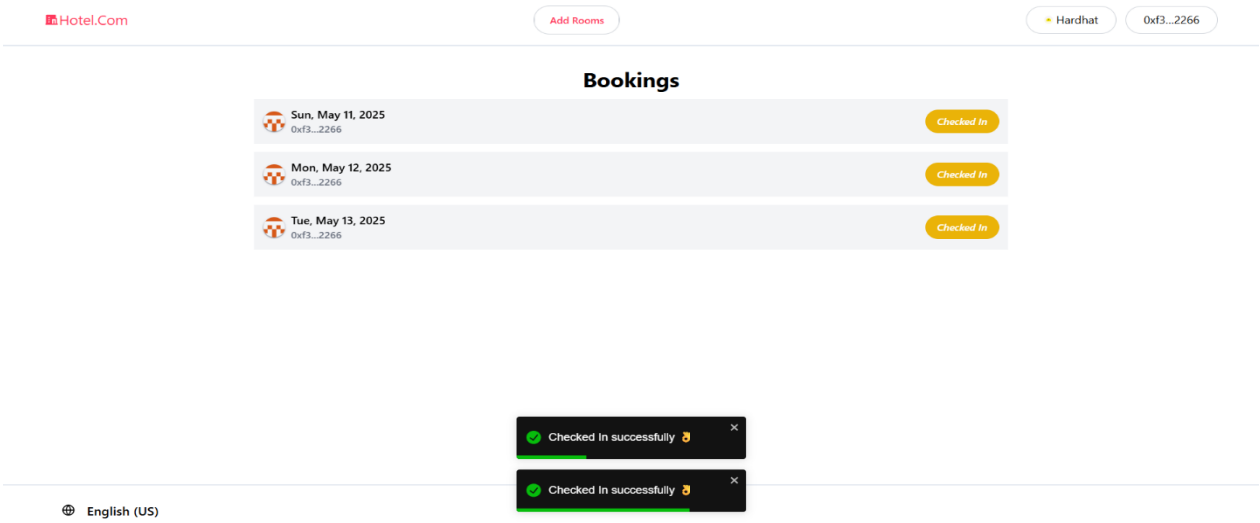


Fig.8.Booking of room by customer

As we can notice in Fig.8. the address on the upper right corner has changed and the options of deletion and updating the rooms is not available anymore that means the address/user which is using the website right now is not owner. As we can see there is option of check bookings right below the option of book after clicking that option, we can check all our bookings and check in or refund in case we don't want to pay visit anymore.

As we choose check in, we are going to get confirmation message on our wallet like all previous processes that we have seen before i.e. Adding rooms, adding details etc. The gas fee will be applied as per the price of the rooms

VI. CONCLUSION

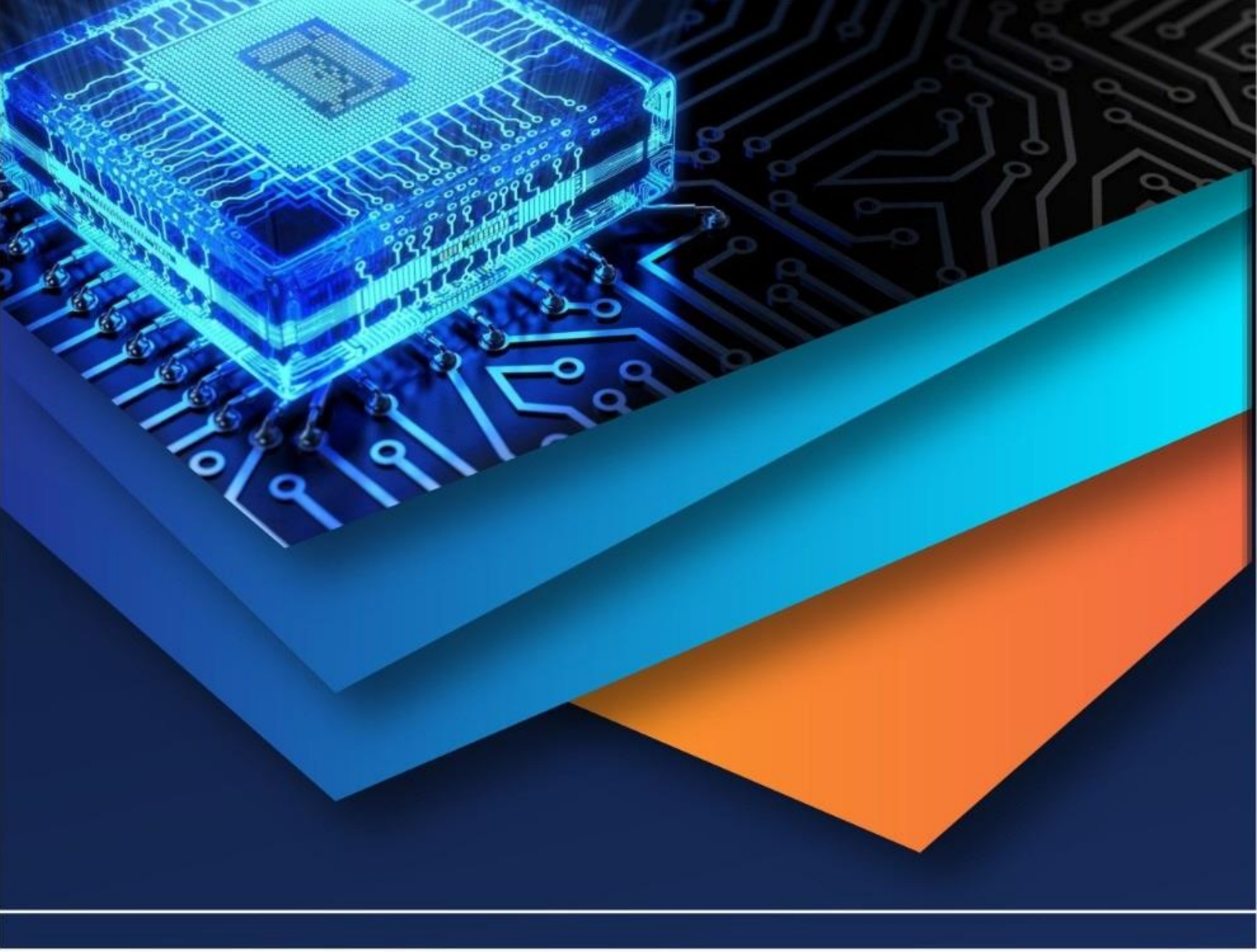
As we have seen and noticed and analyzed from the beginning of the era that making attractive websites and make them work properly with help of talented employees is not the big deal anymore. There are still some casualties that makes that billion-dollar applications/websites less secure which is centralized nature of the website/app. The concept that is presented in this paper is same as the old times attractive website/frontend user-friendly processes but only one thing that makes it different and that is decentralized nature which makes it less exposed to these threats. Blockchain is the concept that is impossible to break till to this date.

VII.ACKNOWLEDGMENT

I would like to express our sincere gratitude towards guide of this project and R.C. Patel Institute of technology, Shirpur to let us use their resources and Dapp developers' group [8].

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