Blockchains Architecture, Design and Use Cases
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Lecture - 60
Concluding the Course

So, welcome back to the last lecture on Blockchain Architecture, Design and Use Cases. So, we are all done in this course. So, we have discussed the many topics. So, this is a Concluding lecture where I will briefly talk about what we have covered in this course. And what we have not covered and then mention some very interesting use cases using blockchain technology that you can explore further for your understanding.

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So, what we have covered in this course is particularly started from very fundamentals of the bitcoin blockchain and their basic concepts of distributed systems and cryptographic public key and a private key based security architecture. We have discussed the blockchain data structure in details. We have looked into the different kind of consensus protocols which are there in blockchain starting from the proof of our mining procedure in bitcoin, the proof of stake, proof of elapse time and many other advanced consensus mechanism.

We have looked into primarily the distributed notion of consensus in the blockchain technology. Then we have touched upon the security protocols in blockchain in little

details, the different kind of security architecture that can be there in a blockchain platform. We have had a detailed discussion under permission model of blockchain which is termed as blockchain too in industry; you have looked into the how the traditional distributed system algorithms can be applied on a blockchain platform to design nice scalable architecture of a smart contracts in a closed environment.

So, you have explored different kind of distributed consensus protocol starting from raft, paxos and then move towards the Byzantine fault-tolerant architecture. We have looked into how BFT can be applied in a blockchain environment. Then Praveen has touched upon multiple industry use cases and he has given an entire demo of blockchain fabric and Hyperledger fabric and hyperledger composer. Hopefully you have learned how to write a smart contract using the fabric platform. And we have discussed about multiple use cases from multiple domains ranging from government use cases, finance use cases, supply chain and trading use cases, the use cases from a data science and artificial intelligence based applications and so on.

And we have touched upon multiple research aspects which are there in blockchain. And this topic of blockchain is now a hot topic, it is being discussed in many top tier conferences around the world both in the distributed system community as well as in the security research community. We have primarily touched upon the secure multi party computation using blockchain and interesting research topic which is being explored nowadays.

We have looked into the scalability aspect of the blockchain, we have looked into multiple advanced protocols consensus protocols which have been proposed in the literature based on the blockchain technology like the Biscoined Algorand this kind of protocols. And we have touched upon the privacy issues there in the blockchain.

So, this is this gives up entire coverage of a huge topic. So, many of the topic we have touched with the fundamentals like the basic topics of distributed system and the howblockchain utilizes the concept of distributed system for developing a nice platform. So, as I have mentioned many of the time, so, our Praveen has mentioned that the success of blockchain is because of combining three different technologies all together; the concepts from distributed system, the concept from security and cryptography and the concept from economics.

So, combining these three technologies all together or the concepts from these three define all together defines a nice architectural platform which is possibly going to revolutionize the way we write down an application so, what I have done.

So, this is a wide range of topics. So, as I have mentioned many of the fundamental topics we have went into details. And many of the topics we have just touched upon give we have given you a basic introduction of the topic or a overview of the topic and we have left it on you for further exploration, if you are interested those are kind of advanced topic in the literature.

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So, we have not covered many of the topics as well. Mostly the requirement that may come from you like as there are multiple blockchain platforms like the Ethereum, Quorum, Stellar, Multichain, Openchain and many others. We have just looked into the demo from the perspective of blockchain fabric because this hyper laser fabric it is used in the IBM in an industrial standard and the industry is developing application using the fabric based platform.

So, we have discussed the detailed programming model on top of fabric, but there are other languages other platforms like Ethereum which is also gaining popularity people are developing applications on top of Ethereum based platform. So, we have not touched specifically on those platforms or at the end Praveen has given you a brief idea of different competitive technologies.

But if you are interested you can always go to the details of that particular technology and look into their architecture, look into their programming model and start writing your own distributed application.

So, the fundamental concept is same. The fundamental concept of blockchain that we have discussed as a part of the course only the programming model may differ. So, you can exploit it yourself to look into further.

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Now, let us look into some Stellar blockchain applications which have utilized this concept of blockchain nicely and given us some interesting applications and made a competition in the industry or made a competition in the market as well. So, as like earlier we will not go to the details of this individual application this is just to give you certain pointers that after this course what you can look for or what you can explore further.

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So, the first application is something called Guardtime. So, this guardtime application it create keyless signature. So, this digital signature is an important concept nowadays I mean for many of the applications you require digital signature.

But gyuardtime it provides you a signature mechanism in a decentralized platform by utilizing keyless technology, you do not require any key to sign a particular document to validate the signature of a particular document. So, it works in a peer to peer witness cosigning kind of model.

So, you can look into their architecture about how they are developing this particular platform and interestingly this particular platform is utilized in Estonia in a large scale. So, they have used this guardtime to securely store, validate the digital record the digital health record of the patients in the government hospitals. As I have mentioned earlier, as well that Estonia is working like a pioneer in deploying blockchain based technologies.

So, we have looked into this Estonia portal where you can be an is citizen of Estonia and participate in their services. So, this is another technology guardtime which they have utilized for digitally signing and document without utilizing any kind of key. So, if you are not utilizing any kind of key for signing a document you are actually free from the fear of losing the key or having a kind of adversarial attack on top of the key.

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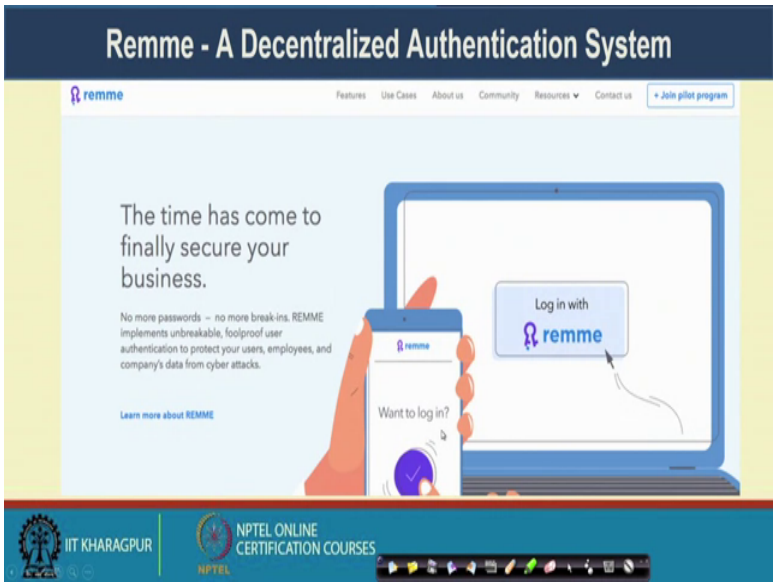

Another interesting application is this remme; remme is again a decentralized authentication system with the help of remme you can authenticate a particular user in an decentralized environment.

So, you can develop multiple business model where authentication is important. And again in this particular architecture you do not have a central server like this other database where you are storing all the user data and use it for the authentication purpose. So, that way interestingly you do not have any central server. So, that is why you do not have a fear of having an attack on that central server. So, that is the remme architecture that you can explore further.

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The third application of blockchain is another application I want to mention is simplify vital health. So, this simplify vital health is an health application to manage health records and patient care with the help of this blockchain based platform.

So, with this platform you will have the health practitioners who can join who can give suggestion to the patients the patients can join the patients can see about their problem then the record of the patients can be stored in a secure way and this entire architecture run in a decentralized manner.

So, there is no central platform or no central database where everything is going all together. So, in a complete peer to peer architecture you are able to connect the patients with the help practitioners and with the doctor's altogether.

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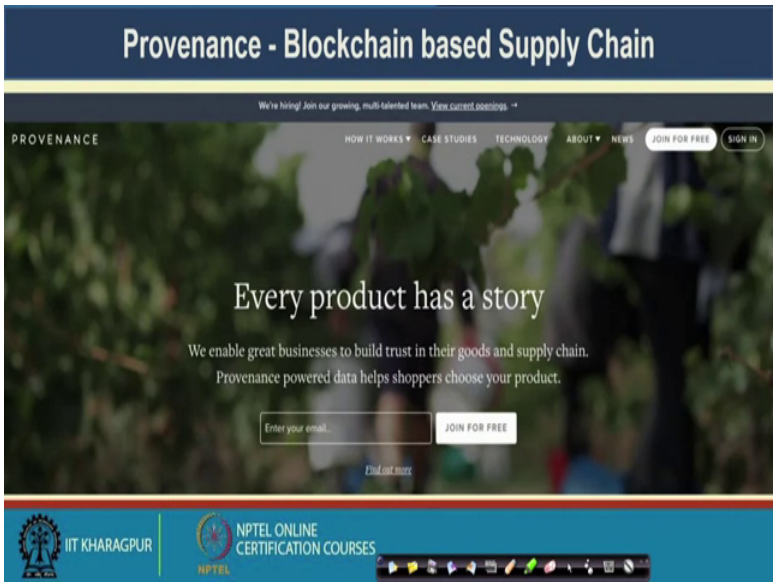

Then another application of blockchain based supply chain. So, we have looked into this supply chain management using blockchain in details, in little details. We have looked into that why blockchain can work like an nice technology for developing supply chain management.

So, provenance is one such application. So, provenance actually maintain a supply chain of different products in the supply chain path. So, it provides a nice tracking platform to find out that how a particular product or where a particular product has been originated. And how it is moving from different stakeholders and finally, reaching to the final customer. So, this is a nice platform for managing supply chains.

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Then this platform called BlockVerify which is again a blockchain based platform for Anti Counterfeit measure.

So, counterfeiting is kind of frauding where you are developing a fault replicas of the original items. And those fault replicas are being sold in the market. So, to design an anti counterfeit measure blockverify that have a nice architecture. So, they work on multiple products like pharmaceutical, luxury items, diamonds and a electronics product. So, it provides an anti counterfeit solution where you can verify what is the origin of a particular product or whether that particular product is an original product or a valid product or not.

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Then comes this application possibly importance from the government perspective; follow my vote, it is an blockchain based platform for secure transparent voting system. Again it is a peer to peer base system. No one is going to store the data and no one will be able to tamper the data the voting data. You can proves yourself that you have given the vote or later on if you are denying that you have given a vote, others will be able to prove that that vote actually belongs to you.

So, nowadays we have lots of controversy regarding this voting based system. So, this gives a nice architecture of utilizing blockchain based technology for the voting purposes. So, I suggest you to explore this further to look into their architecture. It follows a nice peer to peer architecture where people can cast their vote and these based on a decentralized computation platform the vote is getting counted and final vote is getting reported in a fair and in a secure manner.

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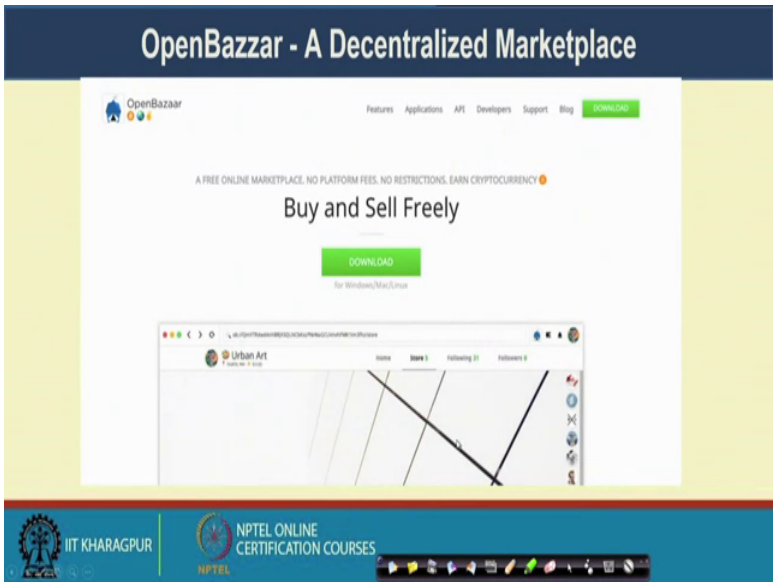

Then this platform called OpenBazzer who is possibly going to be a competitor of Flipkart or a Amazon type of services.

So, it provides a decentralized marketplace where it meets a buyer and seller all together. Now, you can just think of it as an alternate environment of a Amazon or Flipkart where you do not have any central database like this Amazon storage or the this Flipkart data center. Rather this entire platform is decentralized and the buyers and sellers are meeting in a decentralized platform. So, it is just like that you want to sell something you participate in this platform, you register yourself in this platforms and the buyers will be able to see your product.

And if the buyers is going to buy that product then you can directly communicate with the buyer and fits up the price and so on. So, it is again a decentralized peer to peer platform without any middleman. So, the charge is possibly will be much less because you do not need to or better to say you do not have to deal with any middleman like the Amazon or the Flipkart for buying a product or for selling your product.

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Well then there is this blockchain based solution called UBITQUITY. UBITQUITY is a real estate record keeping solution.

So, it maintains the real estate record you can validate the real estate record and the land records if you are purchasing a land you can verify the registry and you can take the preventive measure for a real estate management.

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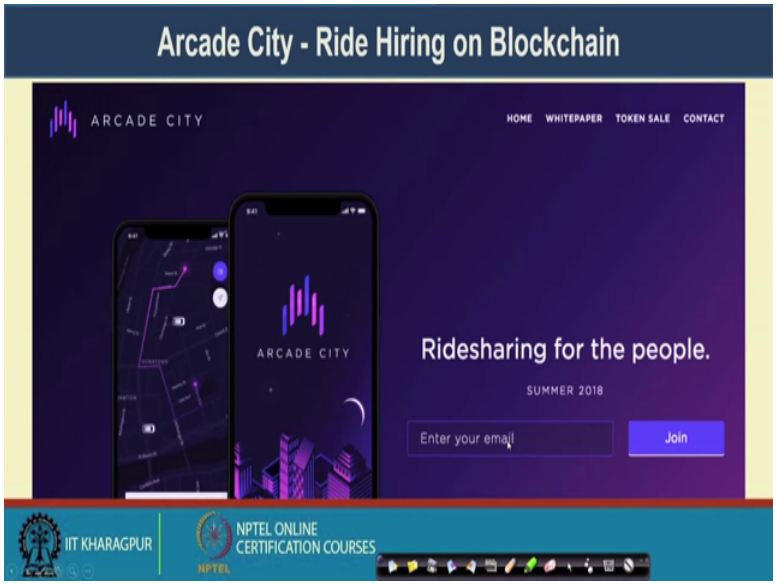

Well then this application and very interesting application called Arcade City. This is again going to be a competitor for a Uber or Ola kind of ridesharing platform. Again you

do not have a middleman here, you are avoiding a middleman and developed a complete decentralized platform for ridesharing.

So, arcade city provides a ridesharing platforms where, the cab drivers and a say a passengers they come together, you can search for the cabs. And if the cab is there an automatic match is being done between the cab and the between the customer. And you can directly avail the cab. So, again there is no such middleman like Ola and Uber, there is a direct business to business model between the customer and the cab driver.

So, it is again decentralized a peer to peer architecture based.

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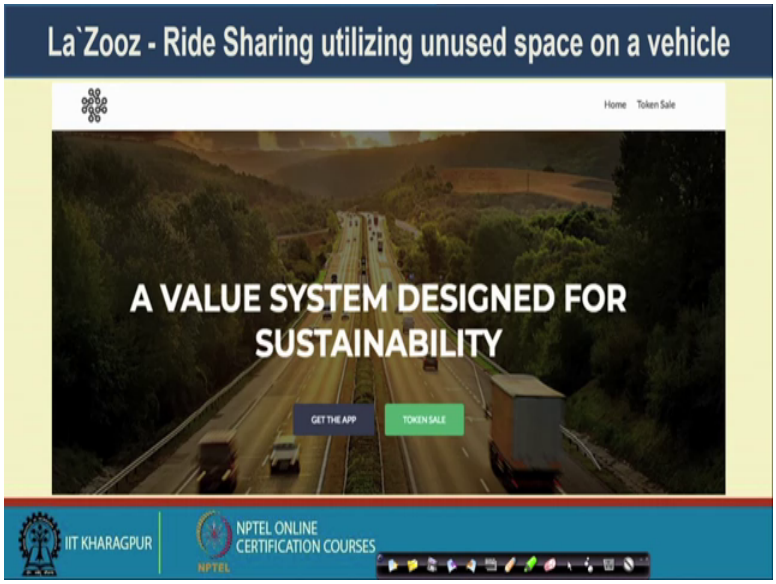

Well, the final blockchain application that I wanted to mention it is called LaZooz. LaZooz is again a ridesharing platform which utilizes the unused space on a vehicle. So, it is little different from the previous application that I have mentioned. In the previous application it is a ridesharing platform it matches the cab drivers with the passengers.

But here it is like that say you have hired a particular car a particular taxi in a city. And there is certain free space in your taxi as well. And you are free to share that space with some other person. Possibly you can also share the final fare that you have. So, what you can do? You can register that empty space in your vehicle on this particular LaZooz platform. And if someone is searching for a vehicle they can avail your vehicle and you two cannot go simultaneously.

So, it designs a sustainable transport platform where you can share the cab, even the passengers can coordinate among themselves for sharing a particular cab.

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So, well, so, I hope that you are now ready to build your own blockchain application. You got certain nice ideas. And hopefully we are able to meet your requirement of learning these new technologies all together. Hopefully from now onwards you will start writing your own blockchain application on your favorite platform.

So, thank you all for attending this course. We are always free to help you. So, if you have any further doubt or anything feel free to connect to either myself or Praveen. We will be happy to help you in designing your blockchain application or to boost up your ideas in this domain. So, thank you again for attending this course.

Thanks.