Blockchains Architecture, Design and Use Cases
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Lecture – 34
Revolutionizing Global Trade

Hello everyone. Welcome back we looked at a bunch of use cases in the financial services industry. So, now, we are going to switch gears and look at another major industry that Blockchain is slated to transform right. So, this is the supply chain and logistics industry. So, this is an area where my colleagues and I have been very working with multiple clients both in India and outside on a variety of use cases right. So, over the next 3 lectures we will be talking about number of use cases in the let us trade logistics and supply chain side.

So, this is about revolutionizing global trade. So, global trade as you know is about shipping goods from one country to another and this is an industry that has seen very little technological penetration right over there even through even in the internet age right. So, this is very little technological penetration there is a lot of paper documents manual effort that is needed. So, we talked about the financing side of trade.

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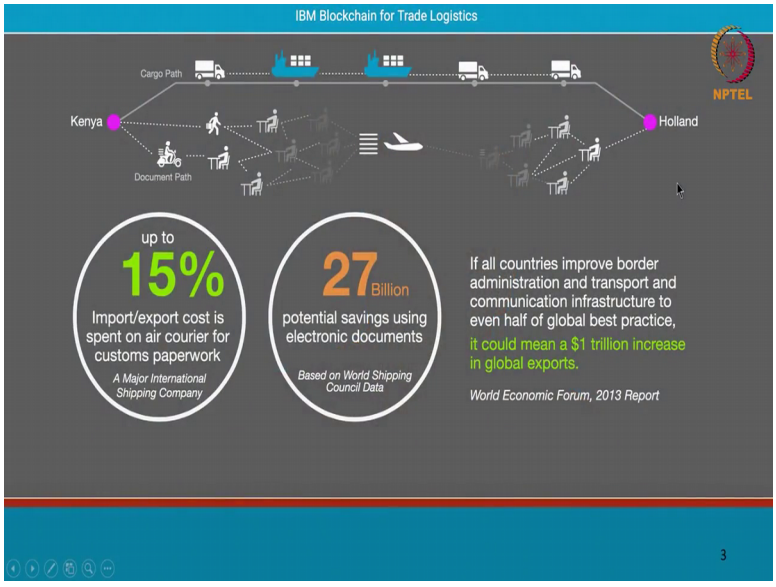

So, how the money would reach from the importer to the exporter? Now we are going to talk about the actual shipping of goods of how they go from the exporter to the importer. So, there is a path the cargo will take. So, it could go on a on a truck on a ship and then it might be in a warehouse for some time and then will get to the other end.

So, I am is cannot taking an example of a shipment going from Kenya to Holland and apart from the goods there is also a document path and what happens sometimes is because the documentation is so complicated and people do not know exactly what documents are required. What might end up happening is you will have 9 documents prepared you will go to the authority and say, hey this is the shipment I have and then the authority will say you missing this one document.

And then someone will actually go on a scooter. This is actually reality, it will actually go on a scooter go to the other place and then try and prepare that other document and because of all these delays what might end up happening is the shipment actually reaches the other end faster than they actually then they documents go through. And once say reach on the other end, then that are this real estate cost that you are paying because the shipment is now in the yard at the import countries port.

And it is just waiting there right and each day is waiting there is a cost associated with it because you have to pay for the warehousing cost that. So, what ends up happening is people actually then end up shipping the documents by first class air freight. So, while the goods take them good go them go oversea maybe taking the a week or 10 days the documents are then flown first class just to avoid some of the additional cost. And it is estimated that about 15 percent of all the import export cost involved is actually just spent in courier in the documents across to the other end because the documents have been delayed.

And there is a huge potential saving if we can improve the if we can go from paper documents to electronic documents and that estimate is estimated to be 27 billion dollars per year it is based on the world shipping council data. And the according to the world economic forum this is back in 2013. So, the numbers are probably even higher now. If all countries improve their border administration and the transport and paperwork even to half of what is considered global best practice right, even half of it we are not even considering people reaching what was considered best practice. Even if you reached

about half of that then you could still save about 100 trillion dollars a year. So, that is the enormity of this of this industry of how it is it is fundamental for every other industry to perform to carry on.

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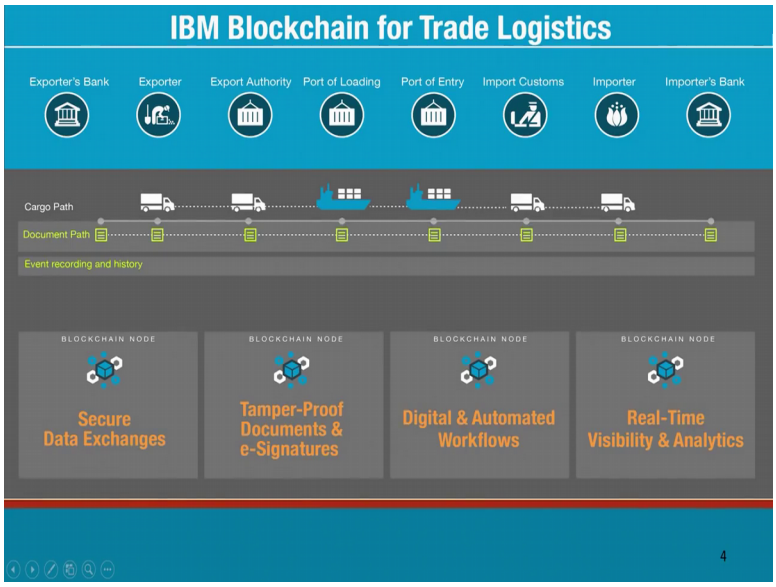

Who are the parties involved? So, as I mentioned this is the exporter and the importer of course, there may be with their respective banks are involved because they are part of the financing there may be customs authorities from both countries. So, these are import customs export customs. It could be other authorities also involved maybe this is a horticultural authority who is going to certify that the mangoes are actually of good quality and they are to eat to export. And of course, there are ports, there are freight forwarders, there are agents in between and in between they are also like people like ground handling agents at the port and at the maybe the if there is the air shipment there is a ground handling agency.

So, is many of these participants were involved into it and almost nobody actually in fact, nobody in this picture has a complete view of everything that is happening. So, it is always like a, a is talking to b, b is talking to c, c is talking to d and so on right it is a long chain that way right and each person has their local view of things. I might know 1 or 2 halves from what I do, but I do not have a picture of what happens into it. So, for the exporter and the importer they have actually no idea what is really happening right. So that is so, that becomes problematic. So, that is on the cargo path.

Then there is a document path where again multiple parties have to prepare several documents. There are many approvals that needs to be obtained both in the import country and in and in the export country and for the cargo path what today's world what happens this people exchange messages. So, these might be EDI messages. They might just be emails sometimes there are all messages that are exchanged in a point to point manner between parties who are interacting in this end to end ecosystem.

So, there is a actual goods that are being shipped there are documents that are flowing there are events to be recorded and there could be other events, also for instance. Let us say I am actually shipping meat from India to Europe. Now the meat needs to be refrigerated. So, this might be a refrigerated container where you are actually tracking the temperature of the goods or this might be fragile equipment for me for which there might be like pressure sensors all these are already in place today. But there is not a very easy way of tracking this or even providing that visibility to anyone else.

So, those it might also be events coming in from IOT devices. So, that is that is what I wanted to mention here and this is all apart from the finance flow that I talked about from the importers side to the exporter. So, there is a cargo path, document path, it could be other events pertaining to the cargo whether it is a messages exchanged or IOT information and of course, the financial flow. Now what we want to ensure with Blockchain is ensure that there are secure data exchanges. So, when data is being exchanged, you can ensure who gets to see this information. So, you can provide that visibility you can also ensure that no one is tampering with that information because it is on Blockchain it is secure there.

So, that is the tamper proof documents and digital signature. So, documents can be signed to say that this particular entity uploaded this document and this authority was the one who signed of this document. And that is valuable for the import customs for instance the import customs now has a guarantee that it has actually come from the authority on the other end. So, it actually comes from the government agency and they can verify those signatures the whole workflow can be automated and that brings in significant benefits.

So, it is not going to be that it this also happens right. So, a container gets left in a warehouse and then people lose track of it and then people go around searching where

the containers there happens also, because there are millions of these containers that are being transported almost every year yeah worldwide. And on once you have this kind of digitized information you can bring in real time analytics on top of it and that is a significant benefit if you want to do things like fraud analytics and so on we half once this information is digitized and automated on Blockchain.

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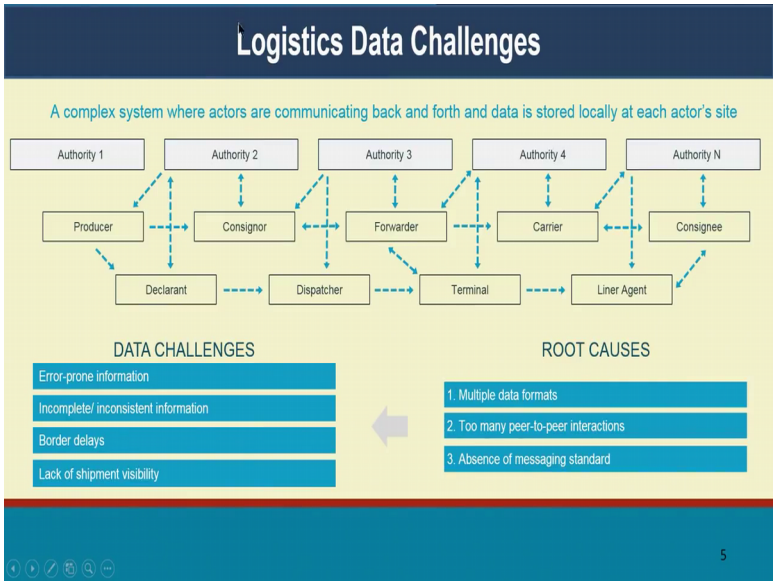

So, what are some of the challenges right. So, why so, you can put it on Blockchain what is so difficult about it? Now the problem here is there is no single data format there is very little standardization in these documents. So, is that becomes a huge challenge and as I mentioned some of these are still maybe 90 percent these documents are still paper documents, people are running around with pieces of paper actually not pieces of papers actually pile loads of paper and there are too many of these peer to peer interactions rates is probably about hundreds of these interactions for any given shipment.

And there is also an absence of any kind of a messaging standard here. So, again messaging could be phone emails it could actually be a standardized EDI kind of a format there are various different things people are using and because of these root causes the challenges becomes that things are error prone. I would think that you would send me an EDI message, but you sent me an email and you thought and I would get their information. So, those sorts of things people and there is also a lot of copy pasting involved.

So, I am there actually people who have 2 monitors. They look at one document in one monitor and then physically a manually copy that information into another document just because the 2 systems are not integrate. And because of that there could be inconsistencies in information. For instance one document could say the value of the goods being shipped is 100,000 dollars whereas, another documents is 110,000 dollars. Now which one do you believe right? So, those sorts of problems come up and because you do not know which want to believe you have stopped what would stop doing what you are doing try to figure out why this discrepancy is there and that causes further delays.

And of course, lack of visibility and because of that exporter has to call and find out hey do you know where my shipment is, why has not it reached the other end. So, those sorts of issues happen all the time.

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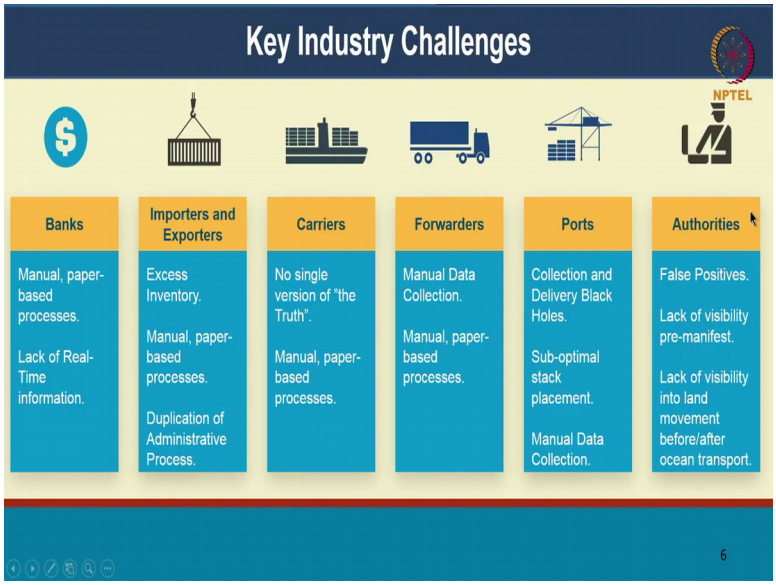

So, these are the main participants in this ecosystem and show what are some of their pain points and how potentially Blockchain can address them. Almost like the manual steps and paper documentation is probably there for almost everyone, it is a pain point for everyone, visibility is a common pain point security becomes a security and trust and the fraud prevention becomes important for the authorities.

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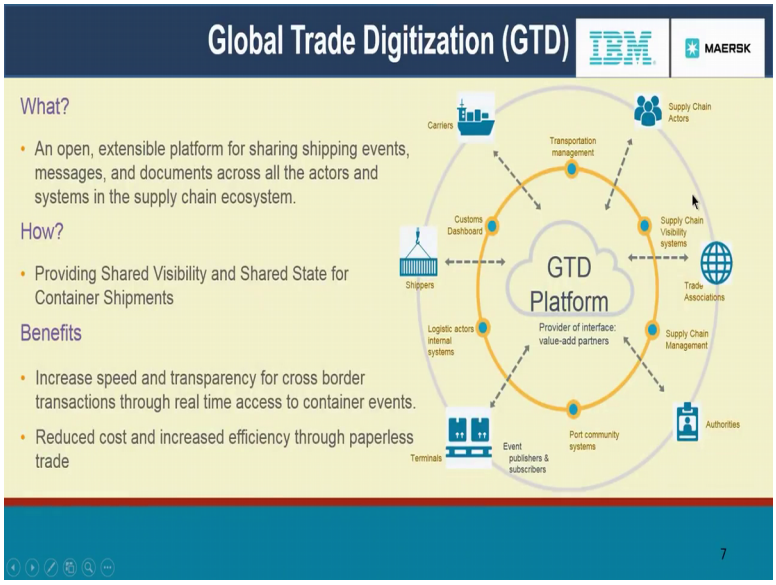

So, global trade digitization is something that I have personally been leading for the last couple of years this is our partner this is IBM's partnership with MAERSK. So, we if created our joint venture with MAERSK for building an open extensible platform for the trade industry, so, the goal here is we want to completely revolutionize trade. We want to digitize all of this information you want to automate them on Blockchain and we want to open this up for people to build applications on top right.

So, then we want to bring all of these ecosystem participants into the network. So, we have we have we already have about 20 - 25 participants in this network. And we want to build the various applications yeah on top of this network and one of the fundamental things that we are starting to do is provide shared visibility into all the events that are being exchanged in a point to point manner.

So, that is one of the core applications that we are building and the other is a common shared state. So, this is about the documents itself. So, can we provide, can we make sure that we are digitizing documents? And we are providing that shared information said access to documents to ship to various participants. And this we are hoping will help increase the speed in transparency for cross border transactions and you can have real time access to exactly what is happening with the container.

So, for instance some of the problems that happen is I have meat being shipped in a particular container, but it reaches late and by the time, it reaches the import side; if the meat has rotted ok. So, then I do not know exactly where things got messed up. So, I

have no visibility into that and there is the other angle of all these shipments also get insured. So, the insurance agencies are interested in learning exactly where it failed and who is responsible for the goods to be spoiled.

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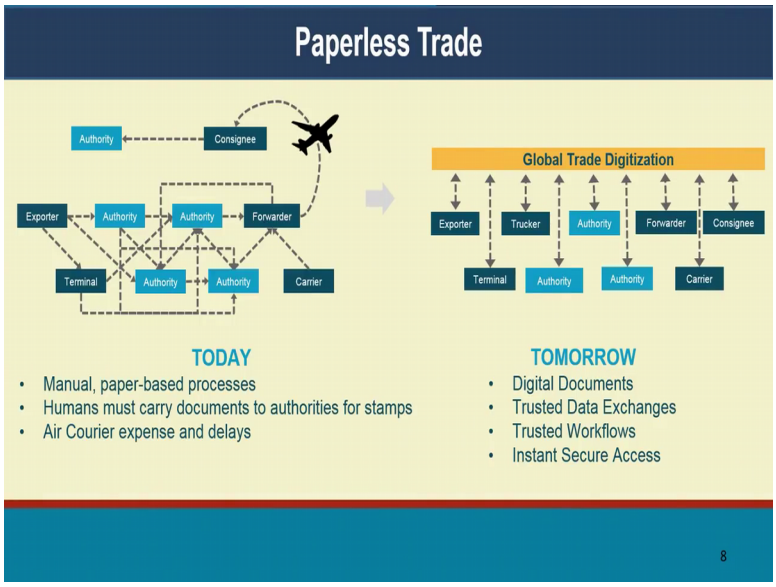

So, the first application that we are building with global trade digitization is actually called paperless trade where the goal is to go from manual paper based processes to digital documents and trusted data exchanges for the documents themselves. So, this is think of the documents as a manifestation of the cargo itself. So, it is going to capture what the cargo is, what the value of the goods are, who are the transacting participants. The approvals that are needed all those are captured as documents and we want to provide secure data exchange between people.

And we also want to automate those processes right, what documents are needed, who has to do this, you want to automate that process as trusted workflows as part contracts on Blockchain. And we want to eliminate some of the expenses incurred due to air courier for instance humans carrying physically carrying these documents from one company to another and so on.

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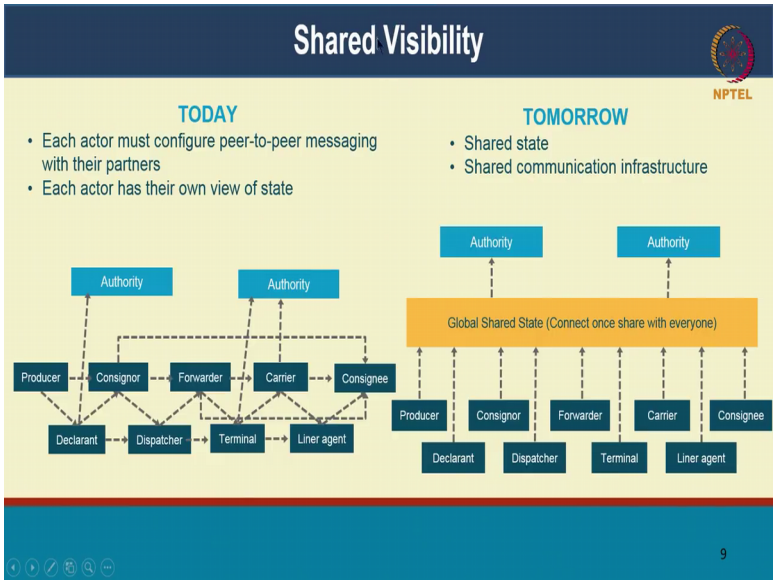

So, the second application that we are looking to build as a shared visibility of the events happening associated with a particular cargo or a shipment. So, today it is all ad hoc message exchanges shown in this is picture just as a representation, but you want to go from that to a shared delay or on Blockchain where each of these entities are sharing their events and people can subscribe.

So, it is almost like a publish subscribe system where people can publish their events and others can subscribe and again there is a shared business value in people coming together and sharing the information. They have today they might just be sharing it with their next partner, but sharing and sharing it in a you know a decentralized led here allows a greater visibility and more secure access to through the data. And you can also ensure it is not tamper proof, it is you have the authenticity benefits. You have a lot of those Blockchain benefits coming in here.

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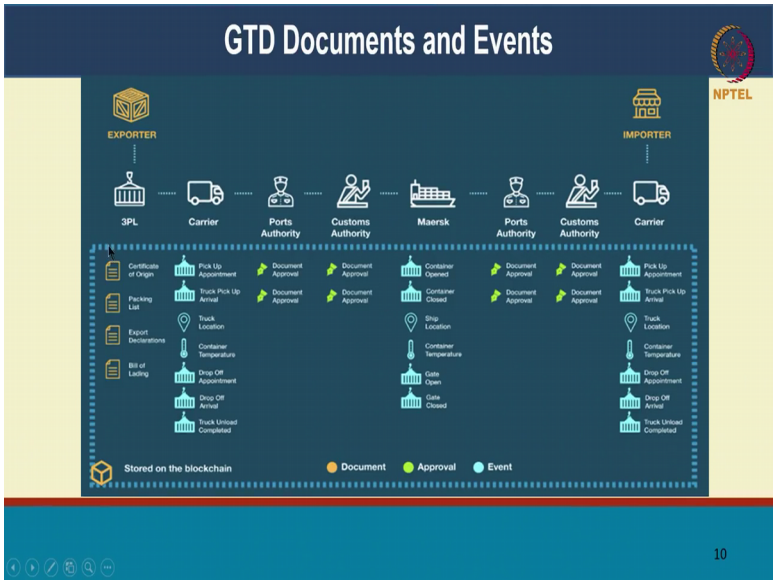

So, here are just a now a view of the some of the documents and events that are needed for at each stage of this of this shipment. So, 3PL is third party logistics. So, they are working with a certificate of origin. So, this says that the goods actually originated from let us say India which is the export country, then there is a packing list. It says this is how we have packed it. So, the shipment itself might be packed in different ways and say and this will have a detailed description of how the goods have been packed.

And there is an export declaration. This has to be a provided to the customs authority for clearing customs on the export side and there is a bill of lading which is also a very important document which also has notion of ownership right who owns this document and it is. So, it is something that the carrier is shows to the exporter or the freight forwarder saying I am going to be carrying these goods on your behalf and I will safely get them to the destination right. So, that will be the bill of lading and that has other details also about might also have specifications of how about how to handle the shipment.

For instance, if it is a fragile shipment you might say this shipment should only be placed on top of a container rack. So, there are many of these and then, there are events about the shipment reaching a warehouse reaching a port what is the temperature of the container. So, there is a lot of these events that are that are shared, there are events that are happening events and documents at the port at the customs authority. So, maersk is the shipping line so, they are actually sending out sending out a number of events about container opened, container closed, what is the location of the ship that is carrying the

container and so on. And so, you can see how the whole range of this is again a just a representation and a subset of all the things that are happening for any given shipment.

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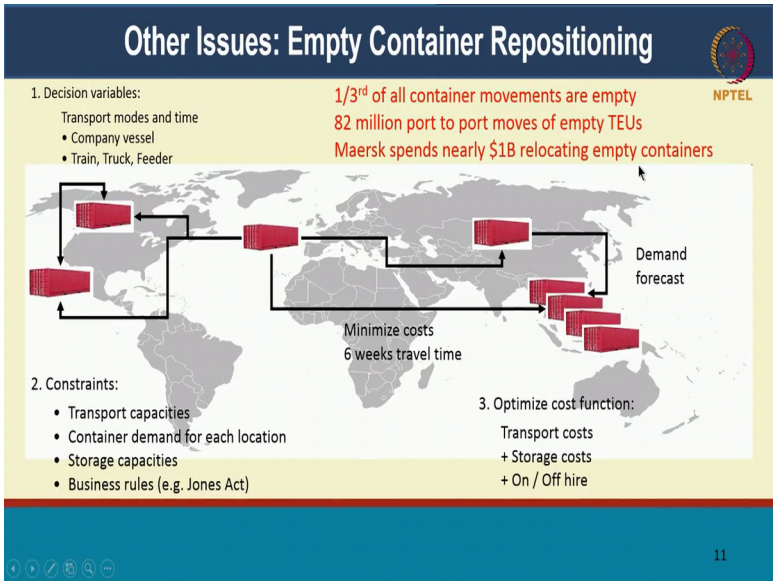

So, I hope this serves to express the complexity of this whole ecosystem ok. So, moving on so, looking at some other issues that face the trade logistics world today. So, today think about this. So, this is about a third of all container movements across the world today are empty and why is that right, you can I give you some examples right this is largely because of the discrepancy in the trade right. So, China for instance is a huge exporter. They have a huge trade surplus with the United States for instance. So, they export a lot of things to the United States and they import very little from and this is also been the fundamental debate between the US and the Chinese governments right and some of the things that president Trump has been bringing in the United States some of the tariffs right because of this discrepancy.

So, think about this. So, all of these exports are going in containers from China to the US we. Once they have reached the US, there are a lot of empty containers. They have to travel back empty to China to take the next set of goods right. So, the all these become empty container shipments and the same problem kind of happens between it say Brazil and North America. So, Brazil is a huge exporter of agricultural goods.

So, we are of actually have refrigerated containers. These are called reefers and you have to ship these goods from. So, the agricultural produce have to go quickly from Brazil to

the United States in these refrigerated containers at they are still fresh when they reach the US. But then there is no one to take those refrigerated containers back, these refrigerated containers as you might imagine because they have refrigeration cooling and special sensors in them. They are more expensive than the regular containers.

So, any goods that are going from US to Brazil most of them are not agricultural producers; they do not need refrigeration. So, why will they pay for these more sophisticated containers? So, they are going to be shipping in these, there is regular containers. Now that also brings in discrepancies rate. So, what we will all these refrigerated containers do? Once they are in theme as how they come back they come back empty? So, this is a big problem for the shipping lines. So, how do I reduce the and this is all just cost rate no one paying to bring back the containers empty.

So, this pure cost for the shipping companies and if they can even reduce a fraction of this it improves their bottom line right. So, they that improves their profits. So, today according to estimates Maersk line spends about a billion dollars just relocating empty containers. So, think about it is a billion dollars spent yearly just say shipping empty container. So, if you reduce that you can save cost there that can make a huge difference for their bottom line.

So, like I said do it the some of the constraints are the capacities of containers. So, there is a there is a difference in the demand at different locations for these containers, storage capacities and also the kind of business rules. So, for instance in the pharma world there are restrictions that certain these special pharmaceutical drugs should only be carried in these kinds of containers. And those containers should not be contaminated with maybe agricultural produce or something else right. So, they should not have germs in them.

So, these are again special business rules that say that if this particular container should only be used for pharmaceutical drugs because it is been ensured that it is not does not contain germs and another things. So, there are many of these constraints that make this whole problem very complex and as of course, you can think of it as an optimization under constraints. So, there is a lot of mathematical modeling also that goes on, on how you can reduce the cost of some of these empty container movements. So, in today's world what is happening is maybe you will step back.

So, in today's world some of these ports and even shipping lines; they are bringing in smart have been capabilities and what does that been. So, there many aspects just not having, but one aspect of it is can I just at least in a local ecosystem. So, let us take the port of Rotterdam right or the Singapore port. So, what they do is at least for let us let me connect the containers in my region. So, there is a lot of shipments may be coming in to Singapore and there might be containers going out in trucks, in rail lines and so on. Can I have that ecosystem at least share? For instance, I will publish the available container empty containers and who wants to use those containers can purchase that right.

So, this ensures allows sharing of these containers and they are doing it in small pockets. So, port of Rotterdam I think is doing it and there are a few other ports that are that are doing this kind of thing where at least in a local like ecosystem. They have some sharing of these containers and they publish these availability of empty containers and others can take those empty containers.

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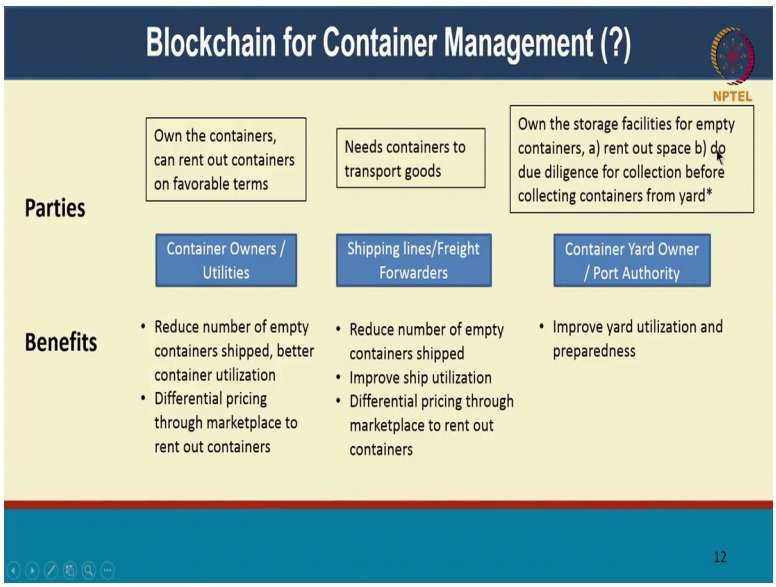

So, that is kind of container management has something again is a it is a neat problem that Blockchain can solve right. So, continue our owners and today there are also utilities that rent these containers. So, there is so, some of them own them and they rent it out as a business. So, now they can publish availability of empty containers shipping lines and freight forwarders are the ones. So, we are actually going to move these containers from place A to place B.

And the yard owners in the port authority are like the real estate agents. So, they are going be the ones who are going to be storing or storing these containers for a period of time. So, the container utilities and owners can publish saying I have n empty containers at this warehouse at this time. And in fact, you can actually do this a priority right you know a ship is going to reach next week at that particular port. Then you can say, I am going to have in next week once the containers are emptied I am going to have so many empty containers next week at this location. So, if anyone wants to aware of those, then I can have those shipped to your warehouses.

So, those sorts of at least locally local optimizations can be done and of course, once the scales you can even do this across boundaries. So, it can actually scale this up to a global marketplace for empty containers sharing. So, this can help reduce the number of empty containers being shipped because now someone who shipped from Brazil to the US can use those same containers to bring goods back to Brazil. Actually Maersk line has actually started a program on that where refries take agricultural produce from Brazil to the US. And maybe there are other goods even if you do not need these sophisticated containers because they are otherwise going to come back empty, they give it to you at a discounted price and allow you to share allow you to transport even regular goods on the refrigerated containers. So, just having that availability of these things known in advance can help optimize this overall complex problem.

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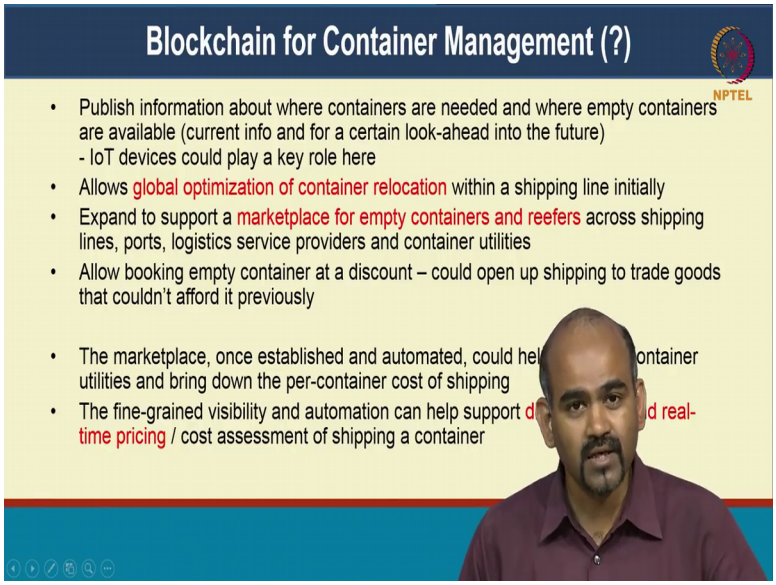

I talked about people are doing some amount of local optimization. So, you can actually take this to global optimization if people come and share this information on a Blockchain platform. So, it can actually build a marketplace for empty containers and reefers. And once you have something like this we can also look at differentiated pricing right based on supply and demand. So, if at a particular location there is a large amount of large supply then we can bring down the price, if there is a large demand for empty containers we can shoot the price off. So, that can help optimize this overall problem and bring down the cost for people who are actually doing these empty container shipments mostly the shipping lines.

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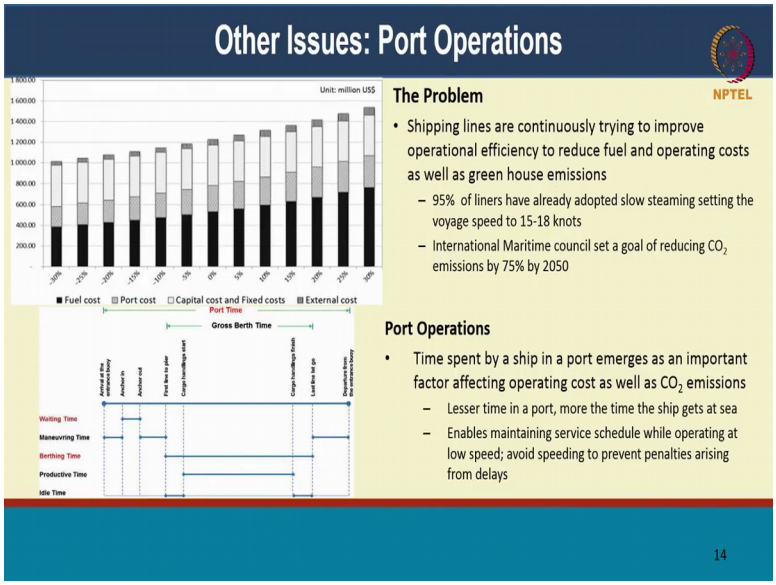

So, the other kind of issues in the logistics: who enters on the port side. So, on the ports think about what the ports do, the ports are almost like a real estate agent. They own the critical piece of land around ports and they do multiple functions of course, when a ship comes in they have to load containers into the ship or unload containers from the ship. So, the loading and unloading happens there and goal of the port would be to minimize the time the ship spends there.

So, think about it this way each time a ship comes in based on the amount of containers you are loading and unloading, you will be get you will the port will get paid right. So, you want to maximize the number of ships that come in at your port. So, if you can unload and unload from a ship very quickly you can have a very quick turnaround then

you can have more ships coming in right. So, it becomes again an optimization problem there.

So, the shipping lines also they are interested in loading and unloading very quickly because it is an energy cost also for them because these ships are consume a maximum amount of a fuel terron and it helps them to optimize. For instance one of the things that they do not want to do is reach the port and find out that maybe cranes are not available to load and unload or it may be the port workers are not available.

So, it is useful to have a estimate of when exactly the ship will reach and accordingly optimize operations of the port or vice versa right if you know that the port is only going to give you a berth to dock let us say 3 days from now. So, accordingly you can adjust the pace at which you go oversee right because you know you are going to get you are going to get a slot only in 3 days maybe you go slower right and that can helps save on fuel.

So, there are a lot of these optimizations that are happening even today, but there is very manual right there very manual decisions that ok, over a phone call you will get to know that it is going to take 3 days for you to get our berth and so, then the talk the captain will decide instead of reaching in 2 days I will go slowly and I will reach in 3 case. So, those sorts of things happen or vice versa also rate the captain can speed up. So, instead of doing some of those things extremely manually and doing like local optimizations. If you can have some of this information again shared on a Blockchain platform amongst multiple ecosystem participants, then again you can do much better optimization and cost reduction for some of these operations.

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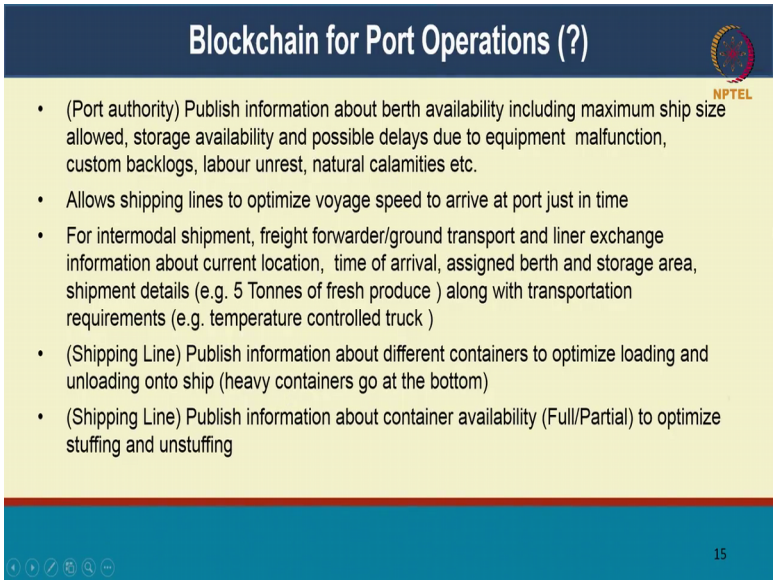

So, that is this is kind of what I talked about Blockchain for port operations it allows the ports to optimize their utilization of cranes and workers and so on and the if they allows the port to operate more ships quickly. So, some of the there are few ports in the world that are very efficient and because they are very efficient more ships will also prefer to go through them right. And for the shipping lines that is great because it helps optimize they can have you can do that they can optimize why it is speed and arrive at the port just in time and um. So, the shipping lines benefit the by publish where would be publishing this information, but they are also getting information back from the port.

So, there is a good exchange of information between ports and then operators at the port and freight forwarders and shipping lines ok.

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So, hope that gives you a flavor of the kinds of use cases that people are looking at in the logistics space, there is a lot of these use cases around people are experimenting with them um. So, there is a short video about IBM and Maersk collaboration on cross border supply chain and trade. So, you should look at you should check out that video gives you a good overview of things.

And there is a noteworthy start up. So, they start up called wave, they are aggressively trying to digitize a number of documents especially the bill of lading which is a very important document in the trade world. So, it I would encourage you to check out what they are doing in this space as well. So, the digitizing documents and they are also bringing in Blockchain to have a secure shared view of information, with that thanks a lot we will see you in the next lecture talking about more use cases in the supply chain space.

Thank you.