Course on E-Business
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Lecture 39 Automatic Data Capture using RFID And Its Application

So we continue our discussion with automatic data capture using RFID and its applications.

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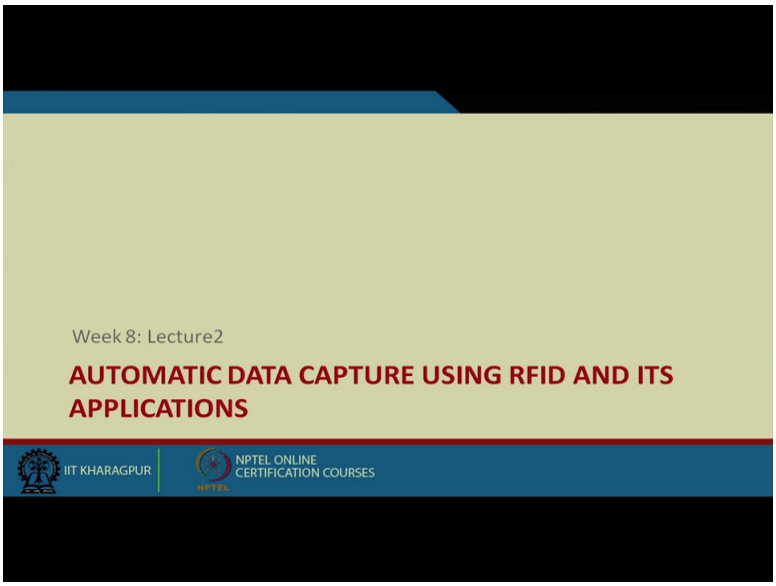

This in in fact to remind you last class we discussed about this technology and in this class we are going to look at few applications.

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To start with we will be first seeing that how RFID is using for warehouse management. Secondly we will see how RFID helps in supply chain management and what are the prospects. Again we are going to discuss what are various concerns in adopting RFID Technology.

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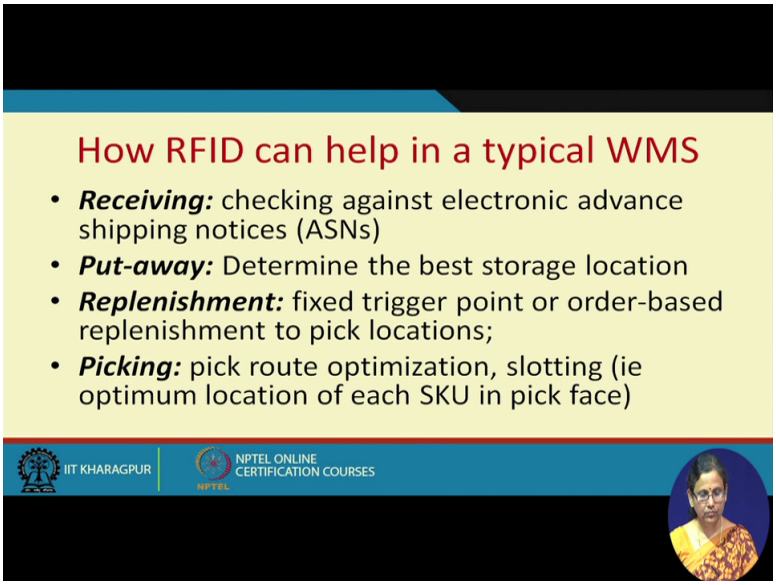

First of all if you remember while discussing about warehouse management system, we were talking about various functions that a warehouse management system has to has to have. So here specifically we are going to see for few functions how RFID is going to help. First considered the case of receiving receiving the items.

So when you receive the items you have to check it against the electronic advance shipping notices which comes from your (())(1:29) supplier. So in this environment when in the RFID and our environment when the items come they come with RFID tags which contains the details of the item. Not only the item level little but also the details of the its use and packages in which they are placed.

So therefore while receiving instead of manual counting or counting using Technology like that of RFID reader your barcode reader sorry barcode reader where which is the line of sight technology and you have to actually bring the barcode reader towards the barcode then only it it it can read it.

But in case the items are put in RFID tags even if they are put in one stock keeping units unit then along with the along with the unit without opening it you can read all the details of the

items that are placed inside it. So therefore while checking the items it is the electronic advanced shipping notices not only the time decreases but also it is very convenient.

You really do not have to open the seal at yet you are able to read everything. Then comes the another function of a typical warehouse management system it is put away. So here when the items come in to keep those packages in the right place to identify which places in the warehouse which oils, which rack is free and putting the items there in depending on the size of the item.

The decision regarding that can now the automated because the item details come along with the RFID tag and as we have discussed last class this RFID tags contained the code but the detailed information actually is there somewhere in the Internet, in a server. So so here also in the Warehouse Warehouse the system will be able to read those details from the server with against the corresponding URL and it can know the details of the items.

Once it was the detail of the item which may include the it dimensions etc along with the data that is coming from the from the warehouse from the warehouse itself where are the locations are free you can match and accordingly you can decide which is the best storage storage location so that you don't waste much of your storage. Then second is replenish management.

Here if your sales are RFID enabled and smart as soon as your item level goes down some Trigger will be enabled and this is as can be taken by corresponding enterprise system. Then in big warehouses picking the items when the request come for getting the items from the warehouse picking the items from various locations in the warehouse is Again Complex distance problem.

This material handling equipments will be moving around the warehouse and they will be picking the items. So finding a proper schedule and deciding the path of this equipment around the warehouse can also be automated If the data can be captured automatically using RFID.

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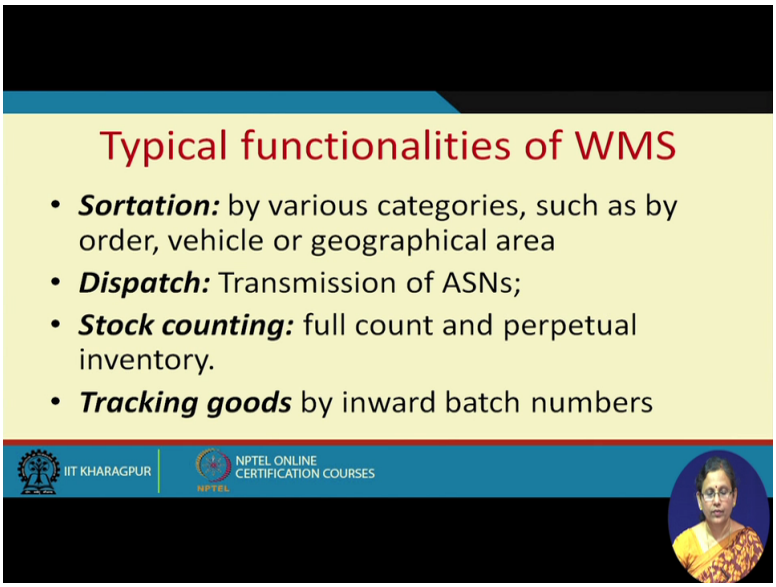

Then next is sortation. Here once again the varieties the item details like about their category is geographical area etc are known from the details stored in the tags. So once the details are known some automatic procedure can be established for sortation. Similarly when the items along with along with the packages with stock stock keeping units together when the leave the warehouse you don't need any manual intervention here for counting the items etc.

Once leave the warehouse at the door itself there can be some RFID reader which will read all the details about the items getting dispatched and accordingly the advanced shipping notices can be made and transmitted to the next supply chain member. Then of course we have discussed so many times that stock counting is very easy in case of RFID in case the items are misplaced that.

And still remain in the store they can still be taken into consideration. So the shrinkage which otherwise includes the items which are stolen or misplaced in the store this shrinkage phenomena can now be reduced with the use of RFID. Then tracking of goods. When the goods are moving along the supply chain they can be tracked by their batch number and other details.

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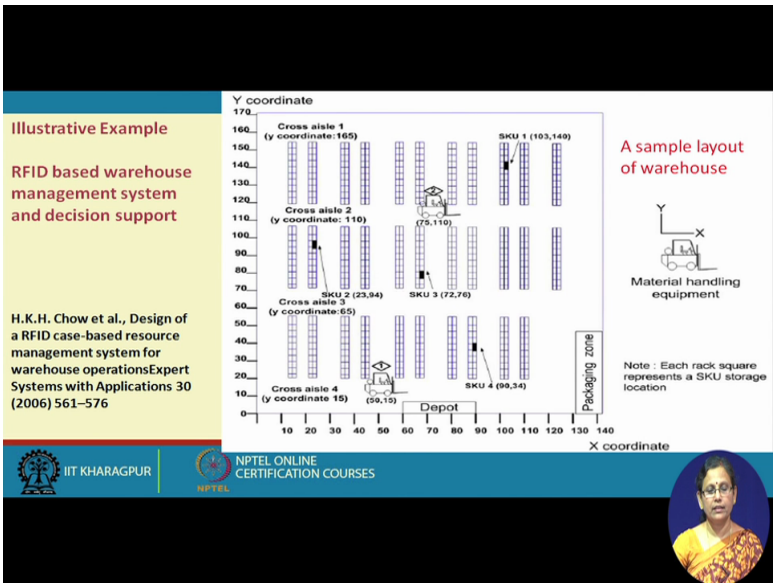

So now Let Us see just look at one illustrative example. This example has been taken from this particular paper Chow's paper and with this example the ideas that I was talking about can become very clear. Now consider RFID based (())(7:48) warehouse and this is let's say this is a very simple warehouse layout plan. These are the aisles and their X and Y coordinates are known.

And within this eye the stock keeping unit will be less and there's the material handling equipments will be moving around there work will be either to keep it in a in the predefined position or pick up. So during both receiving and picking up this material handling equipments will be moving around and once schedule is provided through them as per that schedule they will be picking the item or keeping the item.

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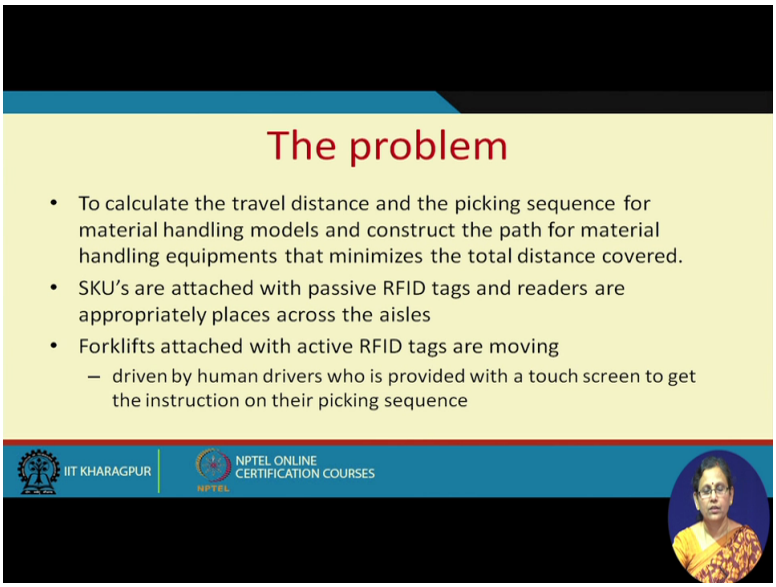

So now in in this particular setting the problem is to calculate the travel distance see we are not associating a decision making problem with that RFID. Now see RFID does what? RFID (())(8:45) RFID stores the data and at the time of need you will be able to interrupt data. But that storing the data is not the solution to any business problem there has to be some associated business decision which is best performed by using those data.

So now the problem here is to calculate the travel distance and the peeking sequence for material handling model and construct the path for material handling equipment that minimize the total distance covered. Now this SKU's which keep the stock are attached with SKU's stock keeping list switch are attached with RFID tags so also the item and the readers appropriately place across the aisles.

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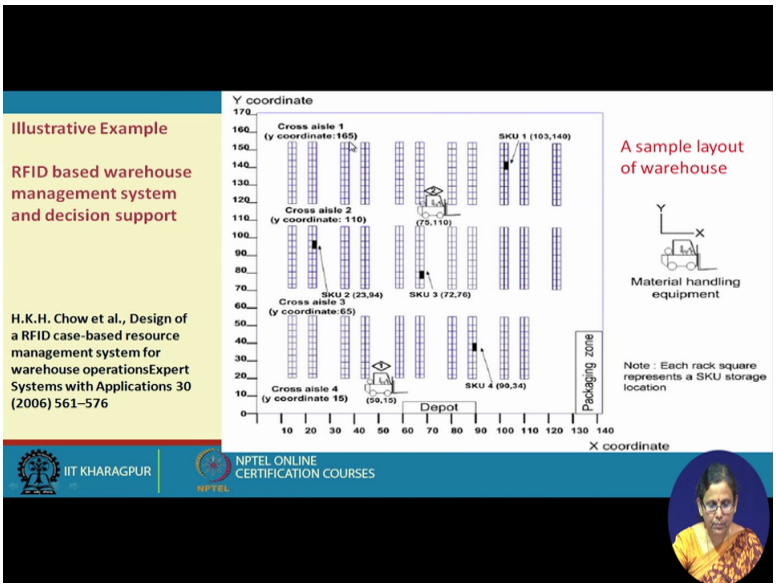

Look to make it more elaborate the items will be kept in this stock keeping units anyway let's say this is one item which is kept in this this place in the eye. Now they are has to be simplified tag as you know the RFID technology and as we know that in supply chain situation mostly the tags that we used are passive tags. This passive tags Do not cannot emit information on their own.

So they need to be they need to be awaited by some nearby antenna which is attached to some reader. So this reader antenna once they come under the magnetic field of The Reader antenna they will be reflecting back the data that we have. So therefore around this place in right positions in the right positions the readers the reader antennas need to be placed.

Now the reader antenna positions when we decide the reader at the positions we have to keep many things in mind so that they are placed in such that kept in such places the maximum coverage is Accord with minimum number of antennas but anyway we are not going to discuss that problem. What we are going to look at is the Antennas are already placed and all the files are covered by at least one antenna.

So therefore whenever you have any any stock keeping unit attached with a passive tag and it is under it is under the antennas field then its position can be then its see knowing the position again only with one antenna it cannot be done that is again another problem. Altogether you need minimum 3 antennas to know the exact location of this assuming that this is covered by at least 3 antennas.

But of course you want only the data not the position then you can use one antenna is sufficient. But now we are thinking talking it as a location problem as well so therefore we assume that again it is covered by at least 3 antennas and their locations can be moved from the system that we are the warehouse management system that we are talking about.

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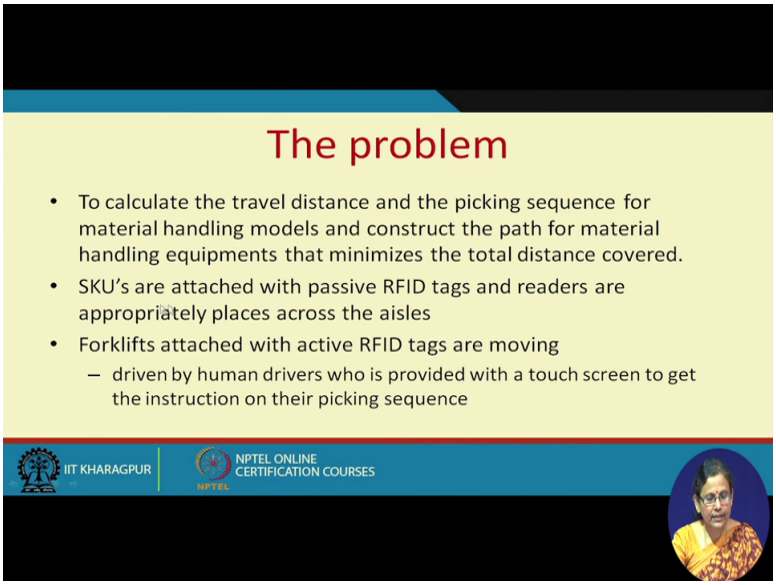

Okay so SKU's are attached with passive RFID tags and readers are appropriately placed across the aisles. Now forklifts attached with active RFID tags. This material equipments with forklifts are they attached with active RFID tags. Now while discussing about RFID we are talking about active RFID. Active RFIDs are basically used for asset tracking.

They have their own batteries they don't need any power of their from external sources like that or passive tags and this RFID this active RFID they are also wifi enabled. Most of the time there Wi-Fi enabled so through wifi they can send their location so we now have the location data of the SKU's placed on the aisles and the location of the forklifts that is material handling equipment which is to go and pick up that package.

So now when this RFID enabled forklifts RFID tag forklifts move around. They are supposed to be provided with a list of items to be picked up because it's a large large warehouse and for one item you should not using it is not the cost effective if you sent every time the Forklift for picking one item.

So depending on your depending on your demand of which all Forklift need to be sorry which all SKU's need to be removed are required to be removed their position.

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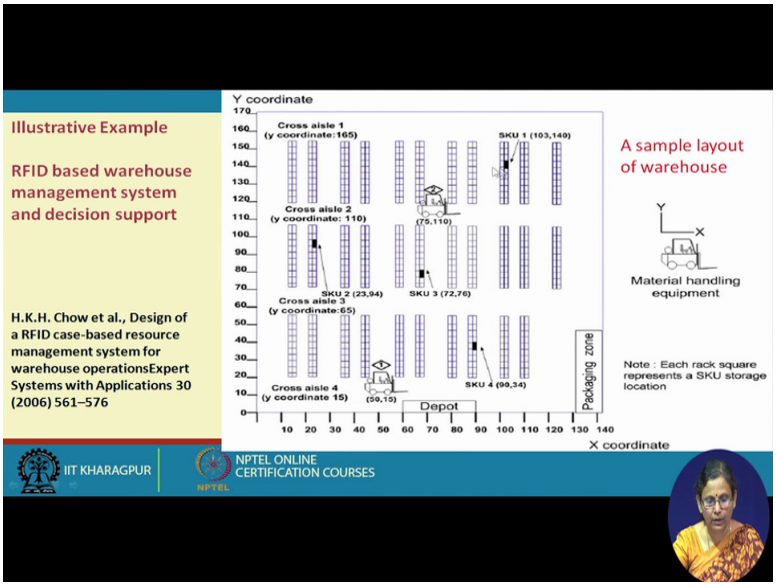

For example here let's say this is one this is one this is another and this is fourth one. This fourth black dots black spots are for skus which need to be removed. Now when we decide a material handling equipment to be moving and picking this items up what is the optimal path so that we will be minimising the total Cost of travel?

Now in this area again you see there are two material handling, two forklifts are moving two material handling equipments with forklifts are moving. Now if the position if the picking sequence are coming randomly every time lets say this particular forklifts every time it did not come back to the to the place where it has to take the list of the items to be to pick up.

But it should also be advantageous if this particular if the driver of this Forklifts is able to know while moving that is a new request has come for pickup. So if it is within its path then and it is instructed where it is then it can pick up. Now the question is there are two such material handling equipment are moving around here.

So which one will be used to pick up some natural answer is lets say we are trying to give trying this is this already has one order and A New order Has Come up that is for this one. Now it is very natural that will be asking this driver of this material handling equipment to pick up this one not through the driver of this particular material handling equipment.

So therefore ask the pickup request come in we should be able to give instruction to this moving right the right metal out of this two moving material handling equipment, we should be able to instruct to the right equipment to get that item.

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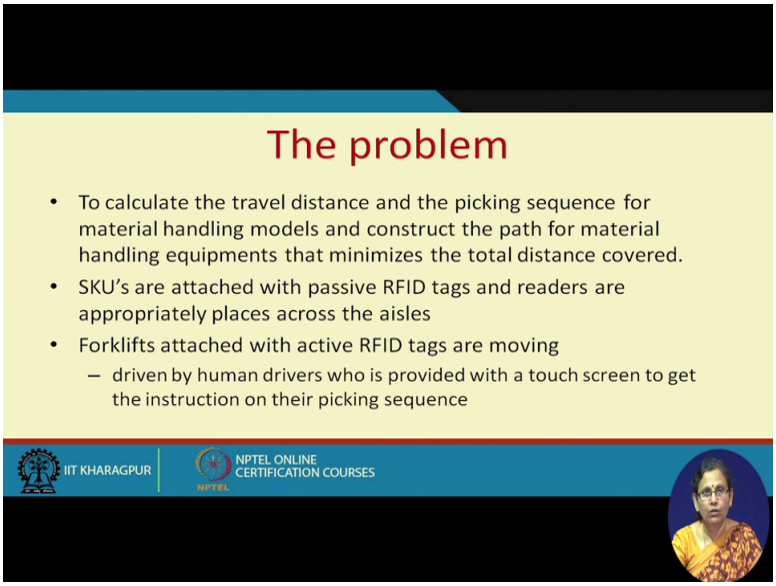

So therefore the problem is little bit now complex. So this forklifts attached with active RFID tags they they keep moving. Now they are driven by human drivers who is provided with touch screen to get the instructions on then picking sequence. So as and when the new items new request come for picking on their picking on their screen they will be automatically getting this.

Now it is a moving equipment it is getting tracked by its RFID it should be getting the instruction back from the some decision support system on the screen the driver should be able to get this instruction on his screen. So therefore that the system the warehouse management system should be remotely sending mail through wifi, it should be sending the data of the picking sequence to the right material handling equipment.

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Look this is some examples where the pallets are attached with the RFID tags. Even the RFID in the side of the back door also there is a RFID tags attached.

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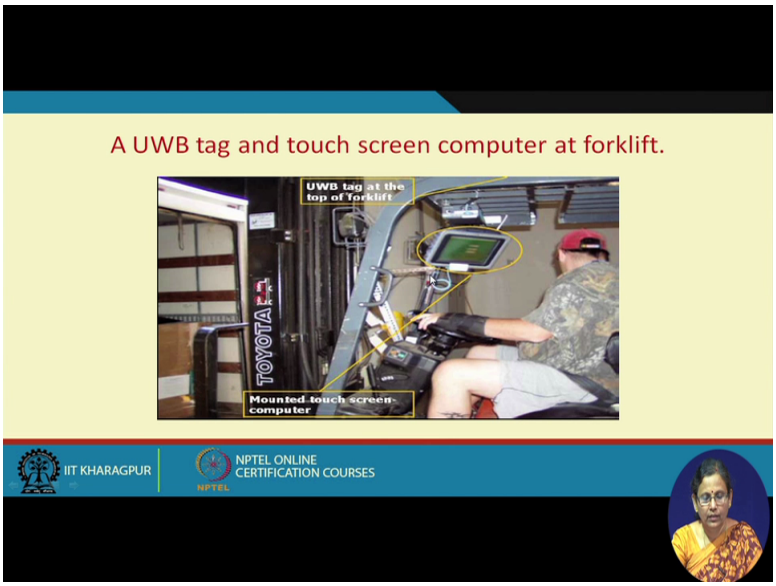

And this is what I was talking about the driver who is moving around the warehouse he will be sitting on this on this matter handling equipment and he has a touch screen computer where the details of the picking sequence will be shown.

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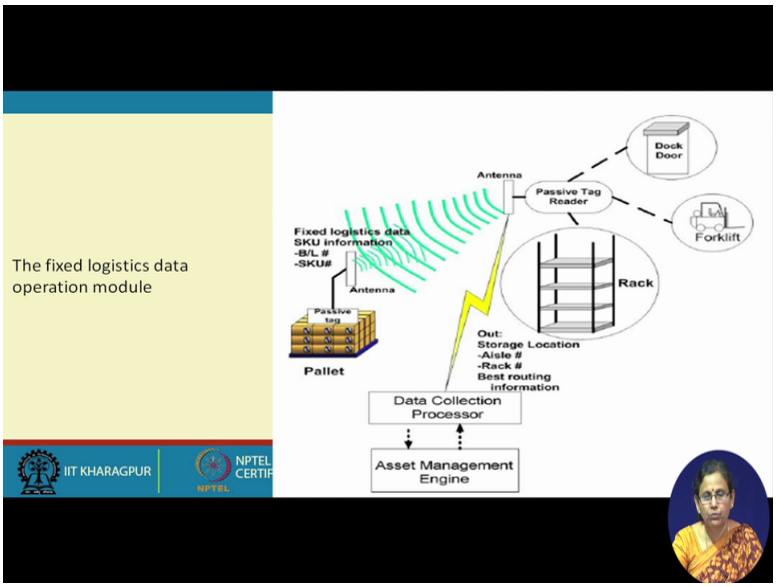

Now the data see we have two types of RFID tags. One is passive RFID tags which is attached with the pallets and stock keeping units and we have active we have some active tags which are attached to the metal handling equipment. So now the antennas collects the passive the this pallets which add items they are in which are attached to the passive tag once they come under to under the field of the passive tag reader they will be emitting the data details.

So also the details will be coming from the dock doors, from forklifts and so on. The they will also we having some readers here also there can be some antenna. Now once all this data is collected about their positions they will be sent to some data collection procedure in fact we talked about multi tier architecture of RFID Data Collection already so we are not going to repeat it again.

You can read the or you can go through the earlier video about this.

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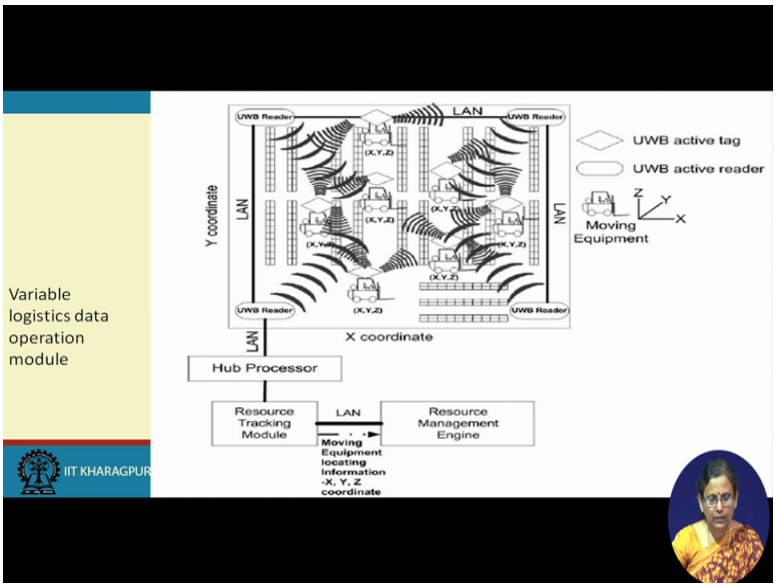

Now this data across this is an example that we will showing and it is also wifi enabled LAN is there and antennas are accordingly positioned. So this signals come from many directions and they are sent to appropriate resource tracking module. Their positions will be their positions and details will be sent to the appropriate resource tracking module.

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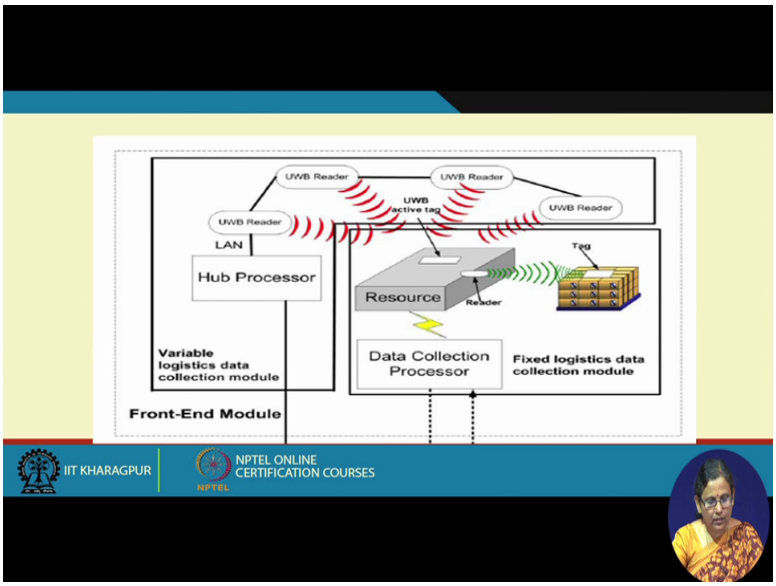

Now this module will have some front end in fact that front end will be see driver is the operates the material handling equipment but in the warehouse itself lets say iin the place where the the picking will be the actual picking delivered will be done there will be somebody who may also have a screen.

So when we talking about the front end module it is about the front end of all the stakeholder which who are involved in or interested in tracking the items and getting the related data. So we have ones the data comes in and it is processed with appropriate decision support for moving the vehicles those details will also be shown to on the computer screen of the respective stakeholders.

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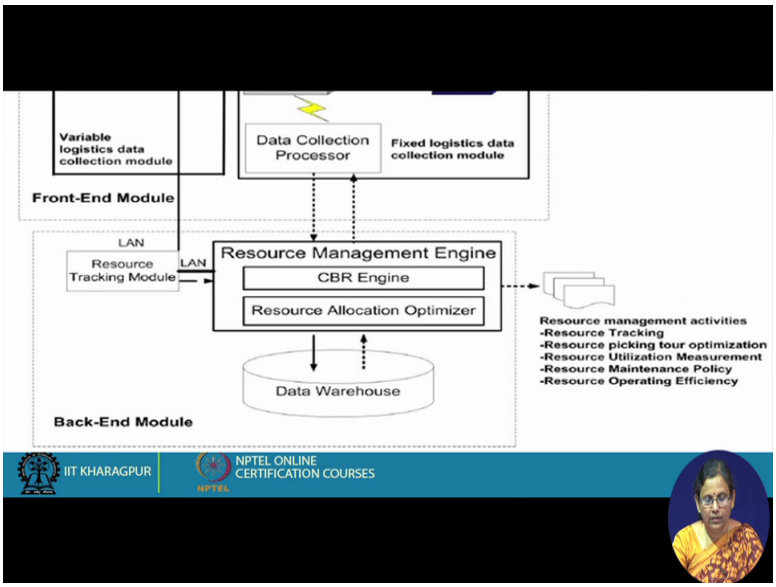

Then in this particular example problem which we have adopted a research paper that I have already told you there is a resource management engine which has a case based reasoning we really do not have to know much because we are not going to the analytical part of it. So but we should be also know that RFID data I have already told you RFID data does not do anything on its own.

It need to be processed and some analysis in to be done. So at least we let us try to understand that it is a resource management engine does some kind of analysis. Analysis about here our problem was to for deciding the right picking sequence and sending that sequence to the right material handling equipment.

So for this purpose the data that is coming from the location data that is coming from both passive tags attached with skus pallets and items etc and to the matter. The active tags which is attached to the material handling equipment all of them once the data comes in then there has to be some decision support module. What the decision support module will do?

This is a support module will be providing the optimal picking path. Now this deciding about the optimal picking path is some of you might be knowing that it is it will be a variation of a travelling salesperson problem so that there is no repetition of the path through which the items are the metal handling equipment is moving to pick up the item and also the capacity constraints of the material handling equipment should also be kept in mind.

So that you do not provide a request to the driver to pick up more number of skus or the pallets which are beyond its own beyond the capacity of the this picking vehicle. So therefore once this instruction is sent from once this instruction is sent from this engine it now goes into the it it is now sent to the front end that we have already discussed that front end is nothing but the nothing but the computer screen which is attached to your metal handling equipment or it is the desktop of your other concerned stockholders.

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Now let us look at how RFID can automate the supply chain? So far we are discussing that RFID is how RFID will be automated in the Warehouse? And within the Warehouse within the warehouse you have metal handling equipments and items kept but this RFID doing this task within the warehouse is fairly is is quite possible because it you can actually place Antennas around the warehouse.

Now when we move to a supply chain the problem is bit different. Different in the sense you cannot have this antennas once the items are out of the premises of the producer or the warehouse or whosoever where the where they are kept and the items are on the road you are

your RFID technology is not going to work because it is you do not have until you cannot really have antennas all along the road.

You use a different Technology for that that we are going to discuss but assuming that you have all the supply chain members have RFID and have compatible Technologies for RFID that they are using. How exactly the item will be tracked throughout the supply chain and what are various ways of doing it that we are going to look at in the next lecture. Thank you very much.