Principles of Engineering System Design
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Lecture - 21
System Design Examples: InSeKTs

Dear friends welcome back to another session on systems engineering. In the last class we discussed about one example of a system design. We discussed about a system which can be used for helping the drivers or passengers of an automobile is known as auto link system. So, we try to see how to use the principles. What are we discussed in the last two lectures. How do we play this principle to the un design of such a system. So, we will see another example today. This is more relevant to the institute. This project was done by students. We gave this problem to the students when to apply the engineering system design principles, and then how do we actually develop a system which can be implemented in the institute.

So, this system is known as the InSeKTs, which actually stands for institute service kiosk terminal the objective of this terminal is basically to provide the services to IIT community, basically as an initiative for IITM's is e service enhancement program.

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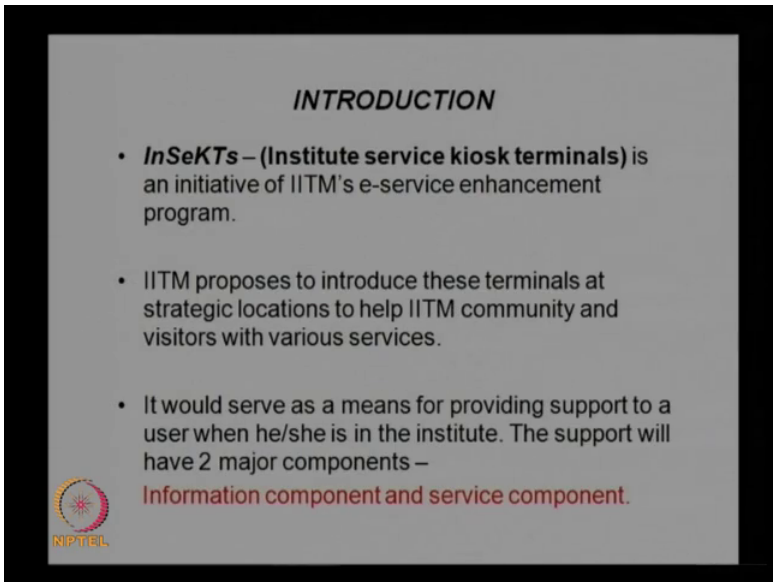

So, it is proposed to introduce these terminals at strategic locations to help IITM community and visitors with various services. So, we want to provide the various

services to the IITM community through this service kiosk. This service as a means for providing support to user when he is in the institutes, and the support we will have two major components; the information component as well as the service component. In the information component, the system will provide various information related to IIT as well as to the surrounding areas, about Chennai and the flight service information, train information, bus information and all related information about the institute, and then the related services, see related areas.

Then the other part is basically providing services. So, one is the information part, the other one is the service part. Services actually provide various services to the students as well as the faculty in various aspects of the academic life. We will discuss this, what are the services to be provided and what kind of information to be provided in the system.

So, based on this we define the mission of the project, and then identify the requirements and then go ahead with a system design again here there can be multiple services provided. So, we do not consider all the services in this case. Of course, we can actually add any services to the particular system. So, we take few services and few information requirements of the system and then we discuss how do we design the system based on the principles whatever we studied so far.

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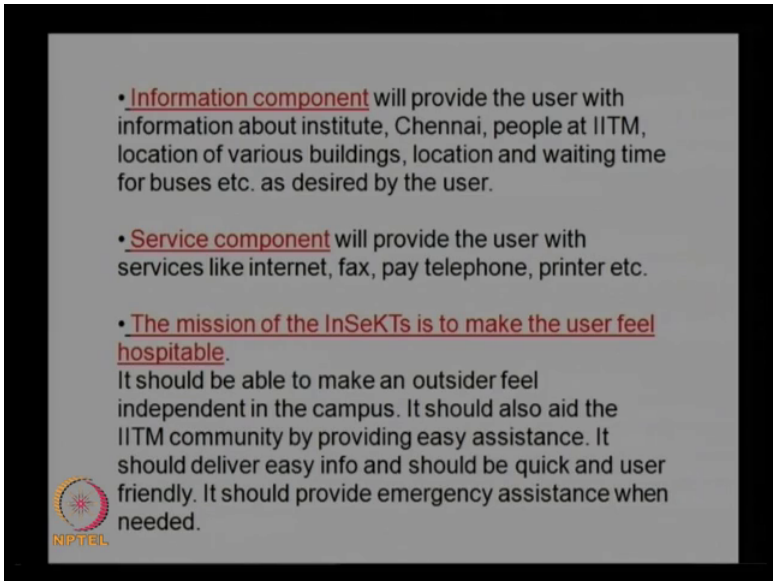

So, as I mentioned the information component will provide the user with information about institute place Chennai, and the people at IITM, various location of various

buildings, the location waiting time for buses etcetera as we decide by the user. So, these are the information component to be provided by the system, and then here the service component which will provide the user with services like internet facts, telephone charges, the printer, then paying fees for the students, and this kind of services will be provided by the service component. So, looking at these two we can actually develop the mission for the InSeKTs, basically to make the user hospitable in the campus. So, it should be able to make an outsider feel independent in the campus. It should also aid the IITM community by providing easy assistance. It should deliver easy info and should be quick and user friendly, and it should provide emergency assistance when needed.

So, the services basically to make sure that the user or a person coming to IIT, he should feel that he can actually get all the information. He is independent, you do not need to depend on many people for various services or various information. So, he will be comfortable in the campus. He can actually go to the kiosk, can get all the information whatever he wanted, as well as we can find out the location of the buildings. You can find out the availability of services, and if he wants to make telephone call or he wants to make an internet search, or he wants to pay some fees or hostel fee for his what. So, all this things can be done easily using this terminal. So, the basic objective is to provide information, as well as service to the visitors, as well as to the community within the IIT campus.

So, how do we provide these services through the system?

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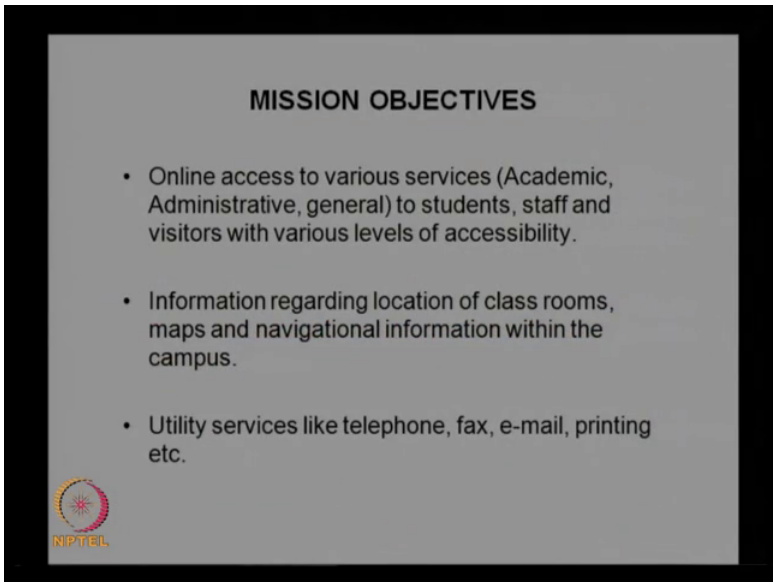

So, mission objectives here can be classified into three, basically online access to various services, academic, administrative and general, to the students, staff and visitors with various levels of accessibility. So, we will be having a various services provided in the system, but there will be various levels on accessibility also. So, the sum of the data can be accessed by students, some can be accessed by staff, and some can be accessed by visitors. So, there will be various levels of accessibility to the services. In the information regarding location of classrooms, maps and navigation information within the campus will be provided. So, these are the objectives, we need to provide their services then the information. Then utility services like telephone, facts, email, printing etcetera also will be available at this service kiosk.

So, we have identified the objectives of the system. So, we have main objectives like providing information, providing services related to academics, and the providing general services like utility services; like telephone, fax, internet, email and other utility services like printing, and other things. So, these are the main mission objectives of the system.

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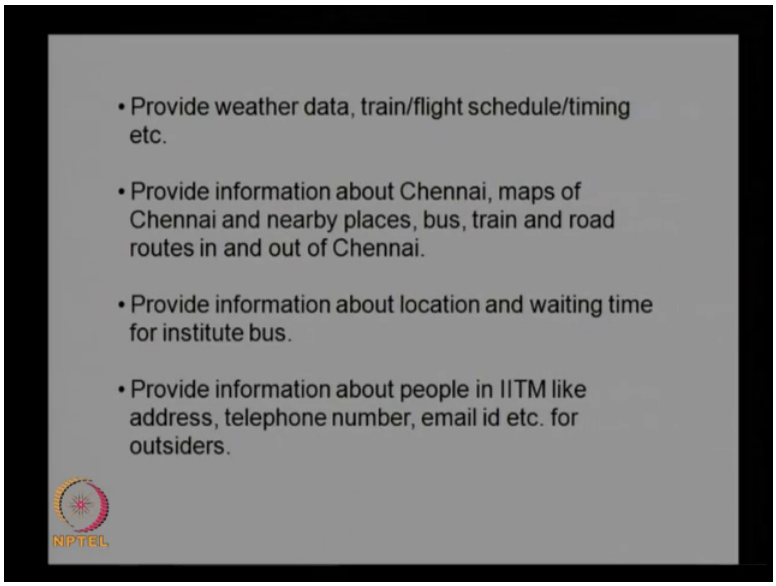

And apart from this we can actually provide the weather data, train fight schedule timings again coming under the utility services. You can provide the weather data as well as train flight schedule timings, than providing information about the city, maps of Chennai and nearby places, bus, train and road routes in and out Chennai. Then provide information about location and waiting time for institute bus.

So, we have an institute bus service. So, we can actually provide the timing of the these bus services, and the weather the points where outsiders can actually get this bus services. Then provide information about people in IITM. Like the address telephone number, email id etcetera of outsiders. So, they can actually do a search in the network the internet, and get the details of the information about people, especially faculty and other administrative staff.

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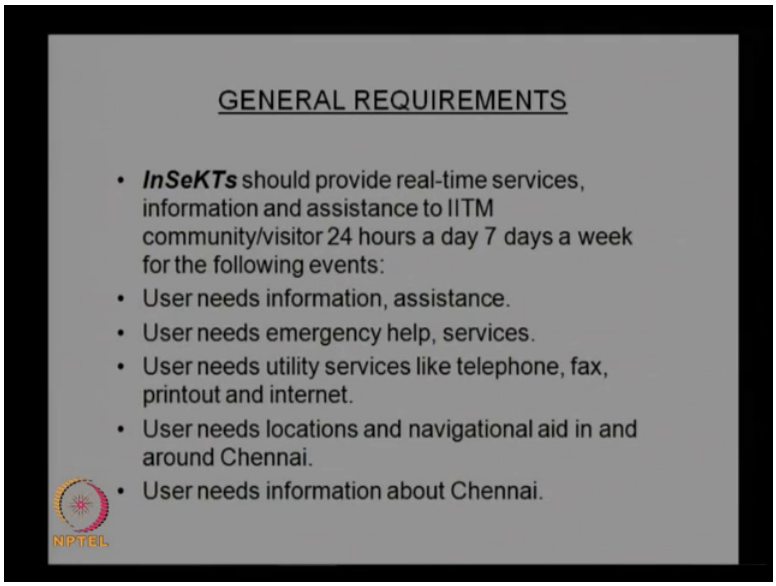

So, what are the general requirements for the systems? Now we know the objective. We have identified the mission objectives and the general purpose of the system. So, how do we actually provide these? We need to identify the general requirements. So, general requirement for the system are basically the InSeKTs should provide real time services, information and assistance to IITM community visited 24 hours a day 7 days a week for the following events.

So, we have clearly specifying the general requirements, the system should be functioning twenty four hours a day and seven days a week, and providing the services like when the user need, some information or assistance it should provide, and the user needs emergency help and services. Then the user needs a utility services; like telephone fax print out and the internet, user needs locations and navigational aid in and around Chennai and user needs information about Chennai. So, these are the general requirements we can identify. So, we stage these requirements clearly, because these are the requirement identification stage, when we develop the system, we need to clearly understand the requirement. So, we write down the requirements what are the basic requirements for the system, like it should be a continuous service without any delay or without any break in between, and they should provide the services as listed here.

Then we can go for the specific requirements. So, those were the general requirements which actually, we can identify from the mission objectives. So, to satisfy these general requirements, we need to identify the specific requirements of the system.

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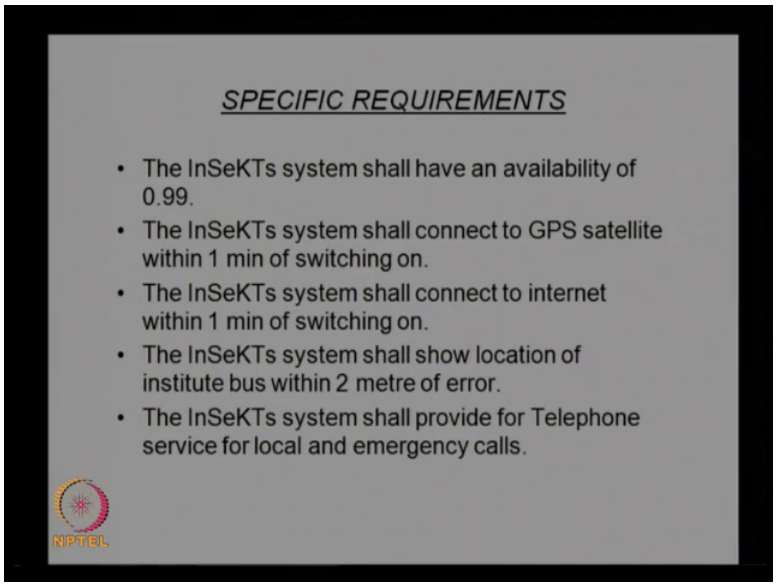

These are listed here; the InSeKTs system shall have an availability of 0.99. So, the break down time should be very less. The InSeKTs system shall connect to GPS satellite within one minute of switching on. There is another specific requirement, because we are depending on the GPS system for the navigational aids. So, the system should connect to GPS within one minute of stitching on. The InSeKTs system shall connect to internet within one minute of switching mode. Of course, these timings again it is up to the designers to decide.

So, based on many parameters they can decide what should be the minimum time requirement for getting to the internet or to the GPS system. So, when the InSeKTs system show location of institute bus within two meter of error. So, that is the error allot, within two meters it should show the allocation of the institute bus, real time information should be provided. Then the system shall provide for telephone service for local and emergency calls also. These are some of the specific requirements of the system.

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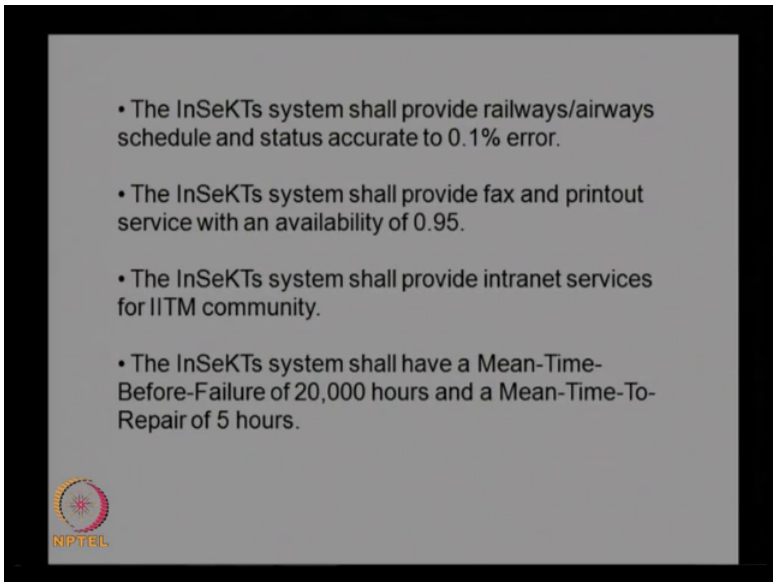

Also the system shall provide railways or airways schedule and status accurate to 0.1 percent in error. The InSeKTs system shall provide fats and print out service within availability of 0.95.

The InSeKTs system shall provide internet services for IITM community. The InSeKTs system shall have a mean time before failure as 20,000 hours, and their mean time to repair of 5 hours. So, within 5 hours the system should be a able to come back to its service note even if there is any repair. So, like this looking at the general requirements, which can actually get the specific requirements of the system, and all these requirements need to be documented as originating requirements document. So, we will see how we actually convert this into the documentation, or how do we write down the actual requirement based on the general, as well as the specific requirements. Then again we have to go for the scenario tracing and find out the input output requirements also.

So, once we have all these requirement, then we will start recording this as the originating requirement document. So, these are some requirements, a specific requirement like the system shall provide weather forecast data in coordination with live news channels. The InSeKTs system shall provide information about Chennai and places in radius of 10 kilometer. Again this 10 kilometer is an arbitrary value, it actually depends on the designer, what is the requirement and then accordingly write the requirement. The system shall provide information about local transport, the bus routes

train and road maps in the Chennai and then InSeKTs system must provide maps and navigation about IITM to visitor.

So, this is again an important part. The system should be providing the navigation aid to the outsider. So, whenever he wants to go to a particular place in IIT, he should be able to locate himself in the map, and then identify the route to the decide building or decide facility, and then how to reach there, and this actually should be linked to the bus service availability, and the present position of the bus, and expected arrival of bus stop that location. So, all this information should be available in the system to help the visitor.

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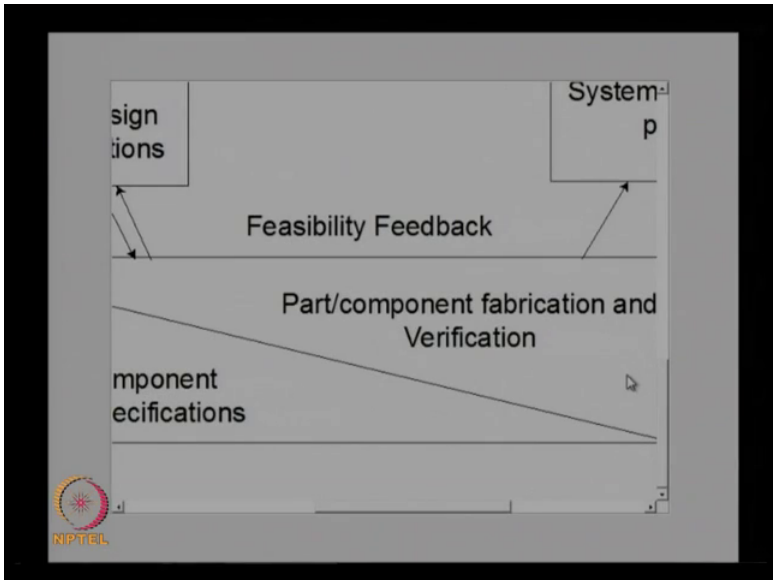

So, let us look at the system design aspect, what we discussed about the system vee. Basically we look at the system design from the system vee process.

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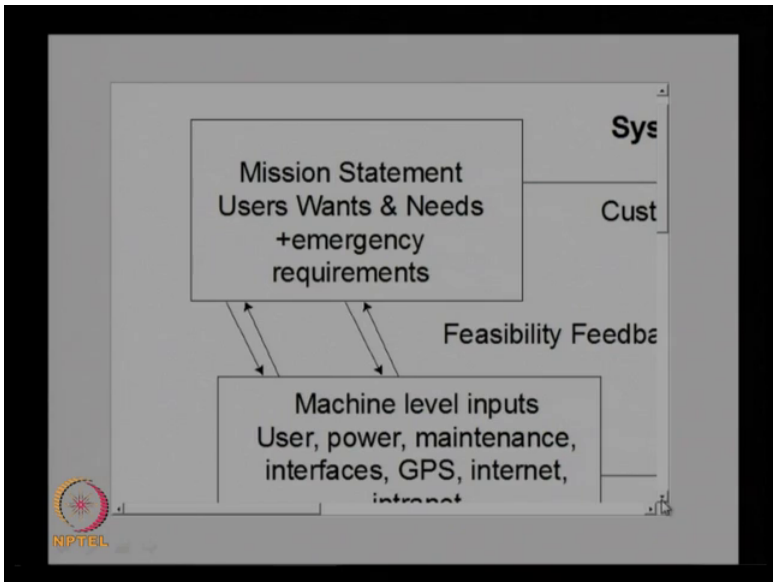

So, as we discussed earlier, they we can actually develop a system vee diagram, to show how we actually go ahead with the design of the system. So, in the system we will process is like a vee. So, we start with the disintegration of the system, and then we go for the integration.

So, we start with the mission statement, user wants and needs plus emergency requirements which we have identified some of the requirements. And then we go to the next level, where we identify the machine level inputs requirement user power maintenance interfaces in GPS internet and intranet requirements.

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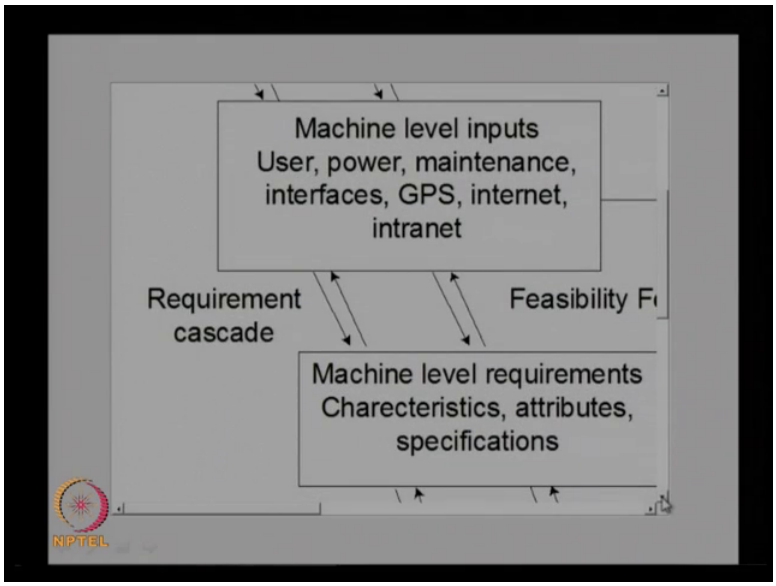

And then we go for the requirements of characteristics and attributes of, and the specifications of the individual components needed. So, we will be defining the system and in this. While defining the system will be identifying the machine level requirements, and the characteristics and attributes of various components, then their specifications.

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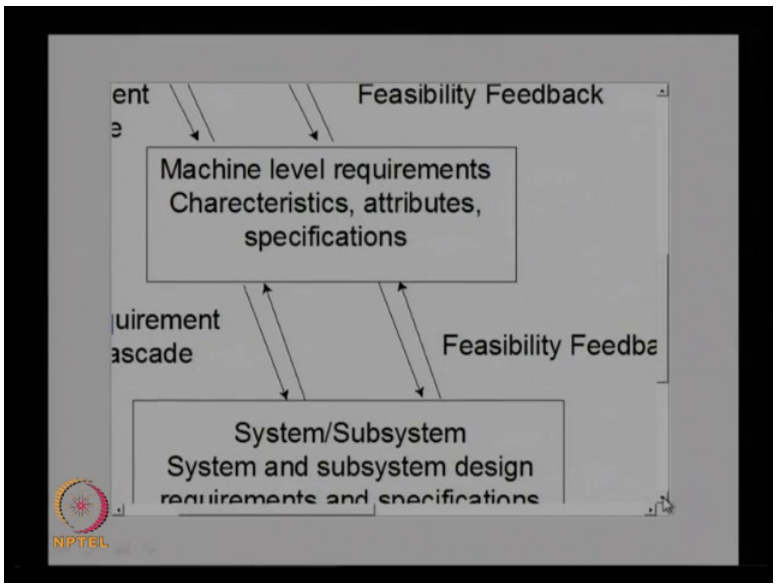

And then we go for the system subsystem or subsystem design requirements, and specifications. And here we will be taking many the requirement cascades and the

feasibility, functions will be taken into account, and there will be interacting to get the system and subsystem design requirements and specifications.

Similarly, we will be going for the details of the parts and components. Once we identify the system and subsystem, we can go for the part and component design specifications.

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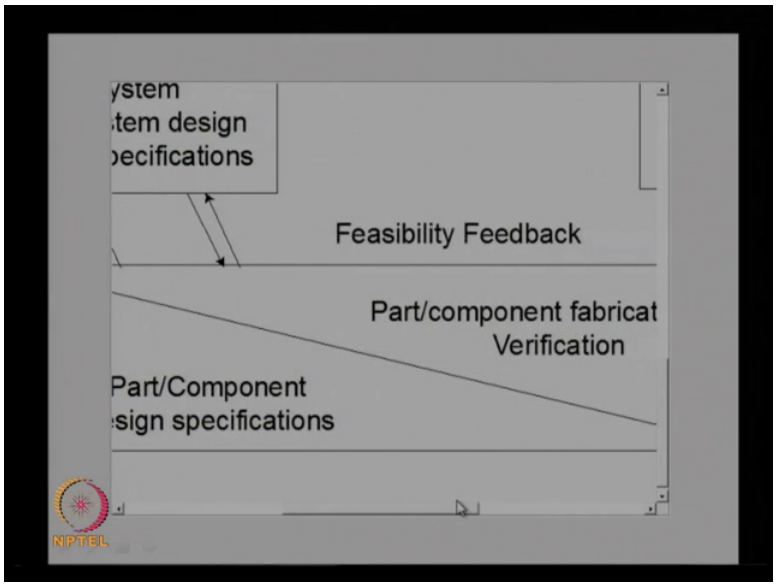

So, here we develop the individual components and parts for the system, and then we will go for the fabrication of the system; the components application; part and component fabrication and verification will be done.

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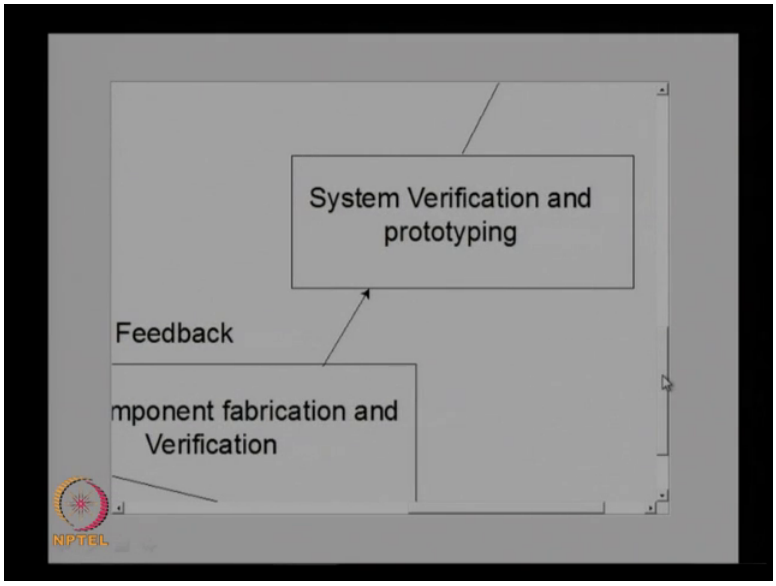

And once these parts and components are verified, we will go for the system verification, and then fabrication of the first prototype from the this component.

So, we will start with the integration of the system and make the prototype.

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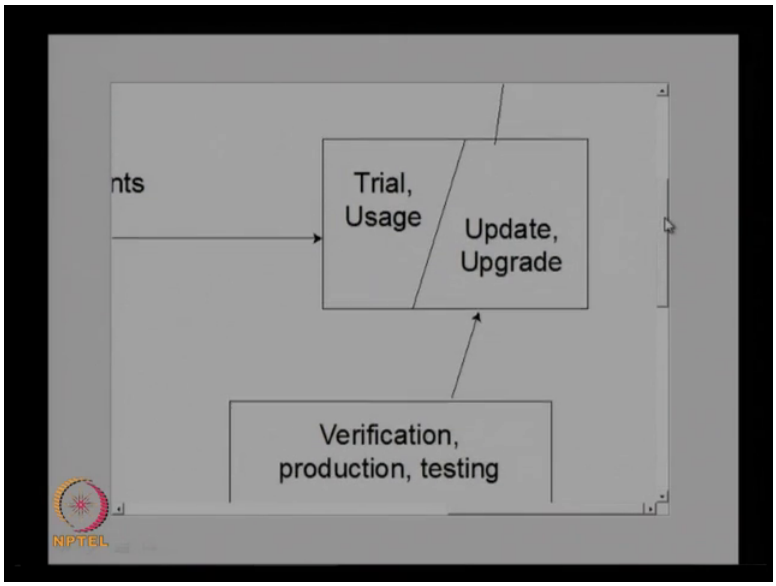

And then we go for the verification and production and testing of the complete system. Based on the qualification test, we will decide to go for the update or updating the system, and finally, we will be providing in this to the customer.

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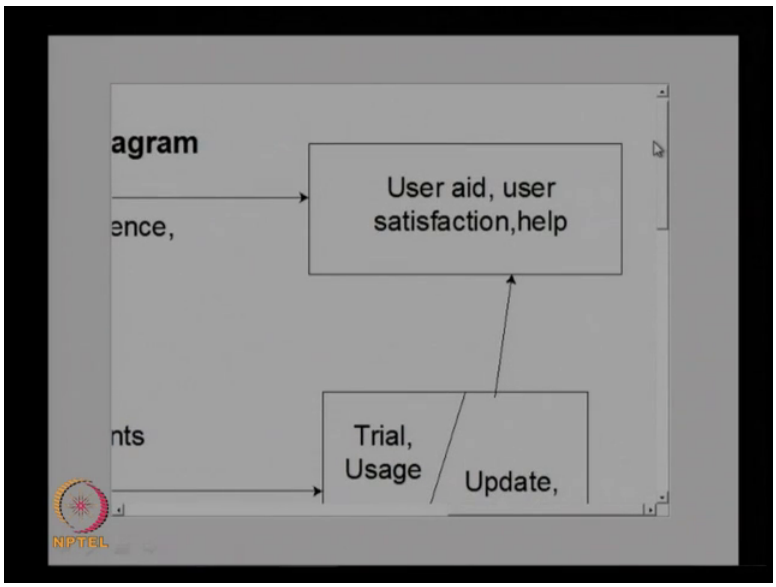

And it will be getting the customer satisfaction to. This is the system vee diagram, where we start with the identification of the requirements, and then we go for the concepts for the system operation, and then we discuss about the other requirements like emergency requirement, maintenance requirements and all other requirements. And we go for the component identification component and sub system identifications will be done. And then if needed will be designing components and sub systems, and then fabrication of this will be carried out, and then integration will start. We will start assembling these components and then make a system with a few terminals, and then do the trials and qualification testing will be carried out.

Bases on the qualification testing we will be updating the system, and finally, it will be given to the user for using. So, that is the process of development of the whole system. So, from identification of the requirements, till the delivery of the system with the many terminals in the system, that will be the complete process, and once it is accepted by the customers, then that actually completes the design process. So, this is the way how we actually go ahead with the system design. We will not be going through are these stages, because the integration qualification etcetera, are all depending on the actual system developed.

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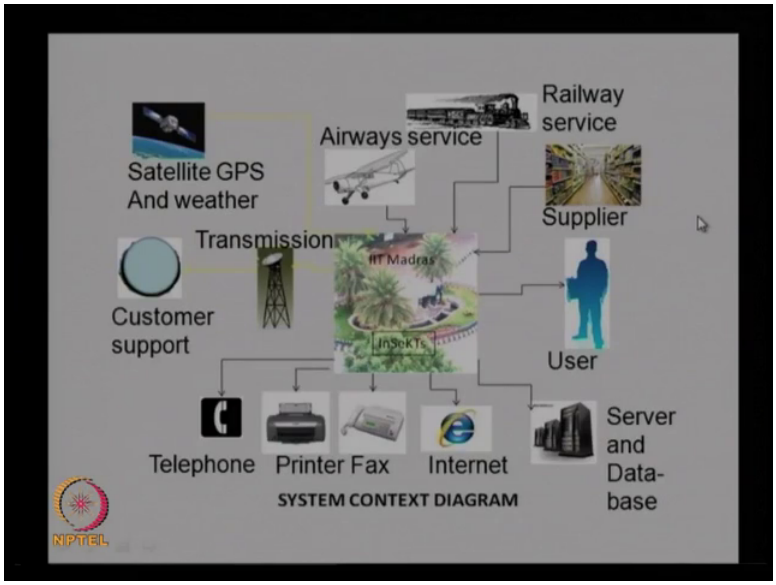

So, that will be looking at the disintegration. So, we will start with context diagram.

The context diagram basically tells you, what will be the approximate concept that will be using for designing the system. So, this actually will identity the external systems, and what kind of interactions are taking place between the terminals and as well as the users. So, all this will be identified in the context diagram. So, this is the context diagram. So, we can see that the terminals will be at different locations are provided in the campus, and there will be a users from inside the campus, as well as from the outside the campus, and there may be different databases which should be connected to the system, basically the database about the IIT facilities, and the locations of the various buildings etcetera. And there will be an internet connectivity to the system, and then for utility services like fax, printer, and telephone will be available with a very terminal. And there will be a emergency support service. There may be a customer support service, directly connected to the terminal.

So, in case of an emergency, the customer support will be activated, and then we can get the emergency services. Similarly there will be other features like the connection to the GPS system. So, will be having a satellite or GPS connection, and then we have the other information like flight services or train services, and then we maybe a. We can actually adds some features; like delivery or some equipment needed for the institute or the students, where if needed that also can be connected. So, these are the possible external system that you can have, which is the context diagram for the system, there actually a we identify all the requirements, or all the system which need to be connected and what kind of interaction needed between these systems.

So, based on this context diagram, we will go for the detailed system design. So, we look at the scenarios under which the system will be used, not to identify the input output requirements, we go for the scenario tracing and getting the requirements.

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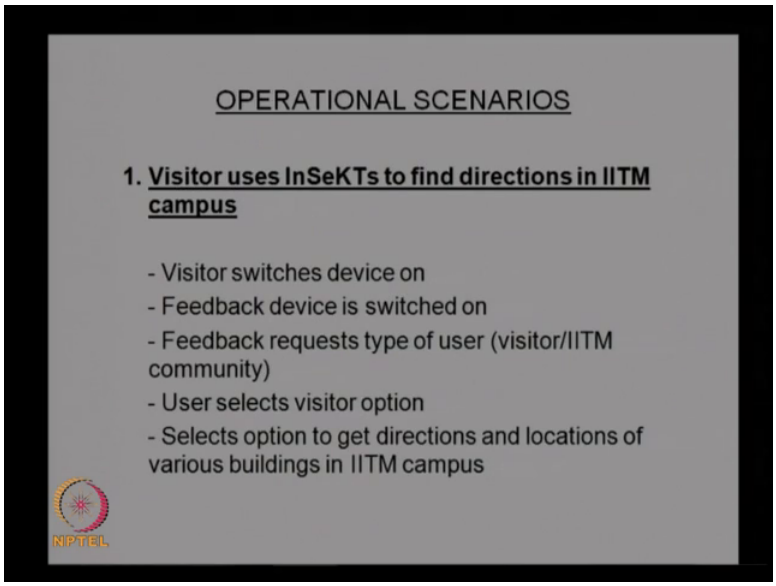

So, we know to do this will have consider various operational scenarios. So, as you know the operational scenarios varies a different situations. So, we will look at the various scenarios. So, one scenario we can identifies that, visitor uses InSeKTs to find the directions in IITM campus. So, this is one of scenario. So, we will go into the details of the scenario, and then see what are the different activities, the operator will be carrying out and accordingly we identify the requirements. So, here we start with the visitor switches the device on. So, assuming that the device is switches off, now we assume that the visitors we need to switch on the device and the feedback will be given that the device is switched on.

So, that the customer I will know that it is on position and can actually provide services and then the feedback request type of user; that is the system will be asking for a feedback requesting for the user, type of user whether he is a inside visitor, inside person or an visitor from outside. So, that information to be provided and depending on the user selection option, and then the option will be provided by in the system for the user to select that actually the requirement is. So, here this a, thus option to get directions and locations of various buildings in IITM campus, will be selected by the visitor. So, the system has to display all the options for depending on the sets of the user, whether is a visitor or IITM community person. So, accordingly will be having a different options and then there are user can actually choose the option.

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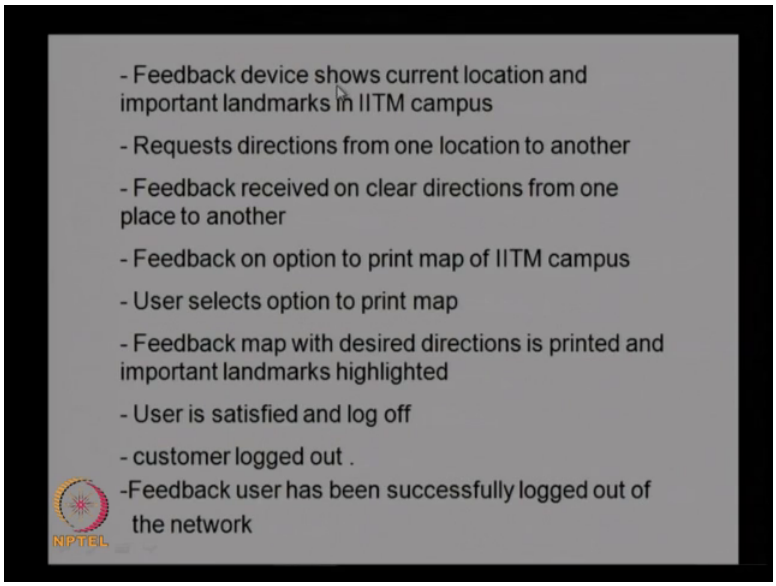

And then the feedback device will show the current location and important landmarks in IIT campus.

So, the current location of the person will be shown, and then various other important locations also will be shown on the map. Then the request directions from one location to another, then the user can actually request for direction from one location to another. So, this is shows that the system should be a capable of taking an input from the user to give the input. So, there should be a provision in the system to take the input from the user to give this data input. So, the location, he has to choose the location, where you wants to go, and then he will be getting a feedback about the directions from one place to another place.

So, this direction will be shown on the map or, but in a form of feedback, either in the form of a map or a kind of a print out, will be given as an feedback and then feedback on option to print map of IITM campus. So, if you Wants you can actually print the map, and then user selects option to print the map, and then the feedback map with the desired direction is printed and the important landmarks highlighted.

So, again the feedback will be given to the user at the map has been printed with the landmarks highlighted. And if the user is satisfied, he logs off and then logs out from the system gives a feedback that the customer is logged out, and the feedback the user has been successfully logged out of the network. This is the series of activities taking place

when the user ask for a help from the system, using for the purpose of navigation within the campus. Like this we can actually identify a multiple scenarios, and for each scenario we can develop this kind of a detailed tracing of the scenario.

What kind of activities are taking place, when executing one particular scenario.

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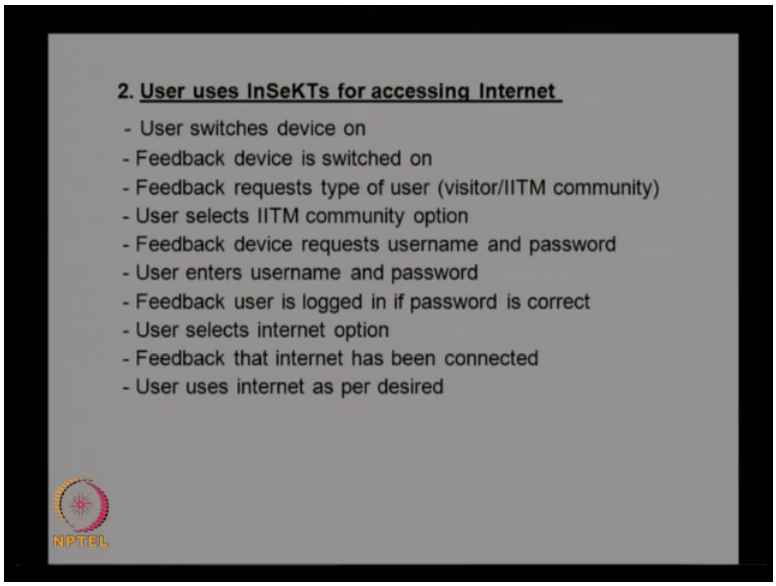

So, this is another scenario, where the user uses a InSeKTs for accessing the internet. So, what are the different stages or different activities involved in the accessing this particular service. So, user switches on the device, then feedback the device is switched on, then the feedback requests type of user.

So, this will be the common for all the applications, because the every case, the system has to identify the user and whether if we belongs to the IITM community or an outside visitor. So, accordingly you can actually the options will be given by the system. From here you can actually if it is for internet service then we have to provide the username and password for accessing the internet service, then user enters username and password, and feedback the user is logged in and if password is correct; otherwise it will be going to another loop, where the password is not correct.

Once he is logged in then you can actually select the internet option, and then feedback that internet has been connected and he can use the internet as per desired. And then again the logging of will be similar to the one, the previous scenario he once the he

satisfied with the service he can actually log off, and then the feedback will be given that he has logged of the system, and that actually ends that particular scenario. So, here by the idea of having these kind of scenario tracing, is to find out what are the different requirements, you can identify from these scenarios. In this case we know that there should be a feedback that the username and password to be given. So, for the particular service you need to give a output from the system or a feedback from the system, requesting for the username and password.

So, if that is correct then only the person can actually access it. So, similarly these activities gives the some other requirements; like the feedback what is needed. Similarly how do we actually enter the data, how do we actually identify the person whether it is a password, or it can actually have some other kind of option to identify the users. So, on these kinds of requirements can be easily identified using the scenario tracing.

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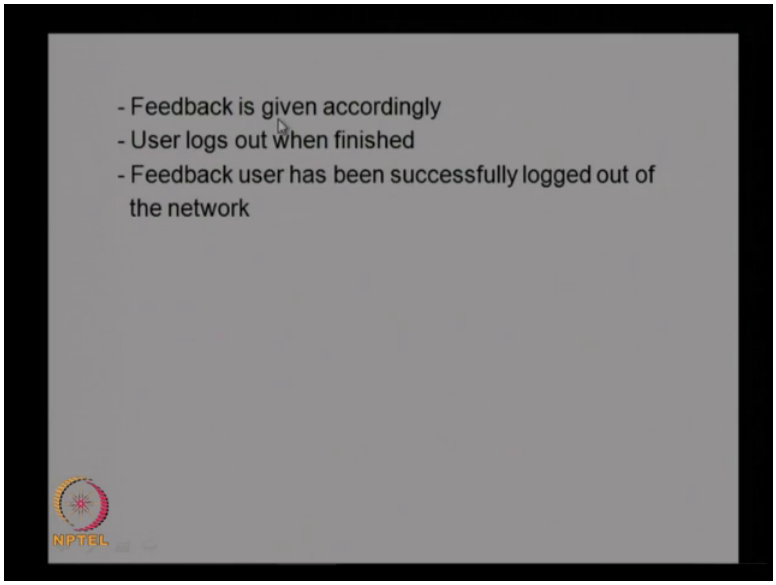

So, here again this I had already told you, that how do you actually come out of the system that the feedback is given; a logs out when finished and the feedback user has been successfully logged out of the network, that actually completes that activity.

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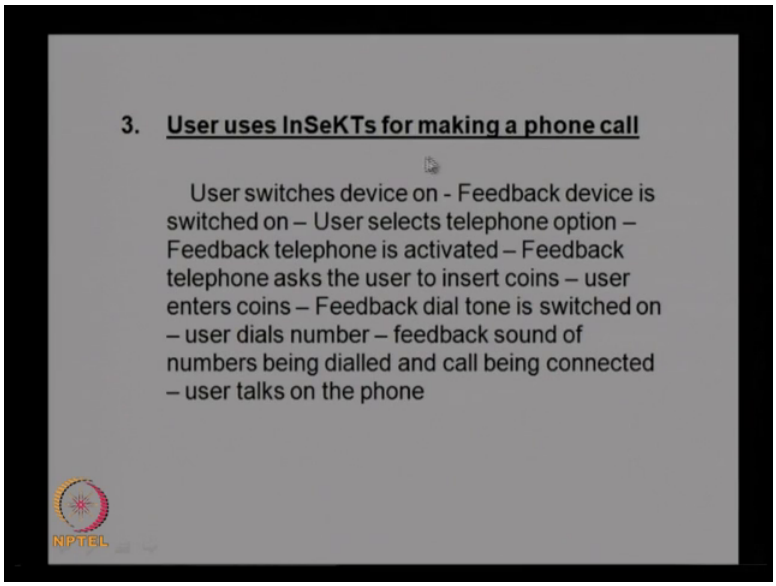

So, this is another scenario. Again for making a phone call. So, what are the stages through which the sort of, it will be going through in order to get that one. So, here again first two will be the same then the user selects the telephone option. Then feedback the telephone is activated, and feedback telephone asks the user to insert coins, if it is a coin operated system or if it is a card operated, then the options will be different.

So, again here are the designer have to make a choice, whether what kind of a system should be provided or what kind of facility to be provided for activating the telephone service. And then feedback dial tone is switched on, the user dials number and feedback sound of numbers being dialed and call being connected. So, of course, this is part of the telephone service. So, we do not need to have a requirements identified for the phone, once it is connected to the telephone network, and all these things will be automatically taken care of.

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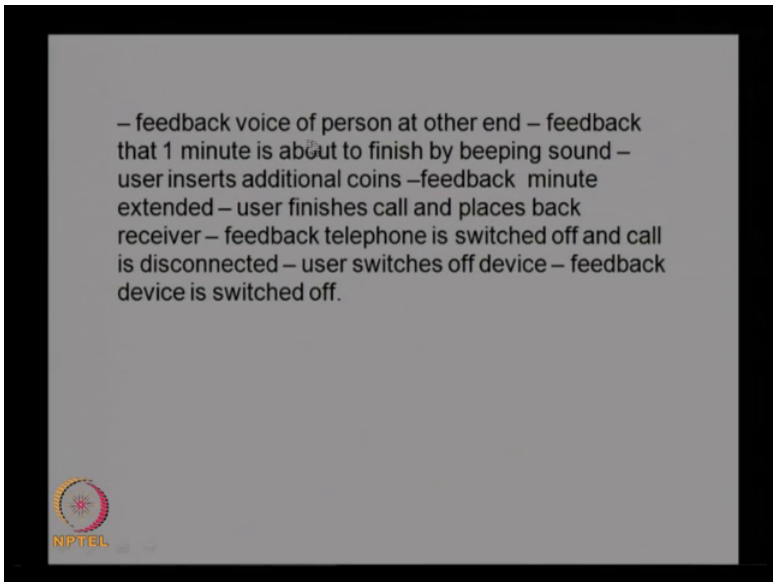

And this is basically how do you end the telephone conversation, if it is basically of by the coil or the card, then that there will be some feedback about the timings, and once the money is finished or we want to add more of information will be provided. And once the user finishes call and places back the receiver, there will be a feedback that the telephone line is switched off and call is disconnected. And then user switches of device and feedback devices switched off, that will be given as a feedback.

So, these are the various activities for that particular action.

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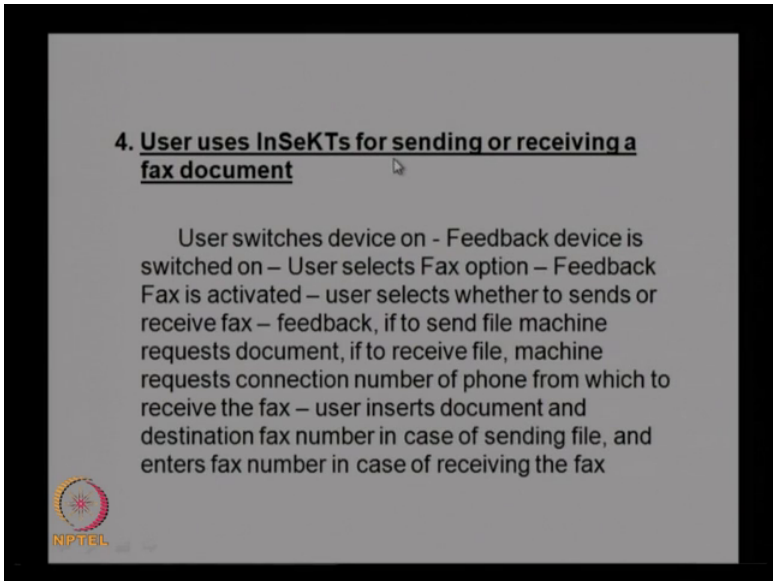

This is another one, and similar to the previous one, let basically sending or receiving a fax document. Again most of the initial activity should be almost same, instead of telephone, he will be connecting to a fax option, and then fax service will be provided. So, here we need to see is, how do we actually provide the user with the some facilities for feeding the paper, and then directly connecting to the fax machine. And then once they leave the feedback that it has been completed, then actually we can log of similar to that of the telephone service. So, again the idea is to get all the activities are noted down or recorded so that we can see whether any particular additional requirement is to be provided in the system to meet that particular service.

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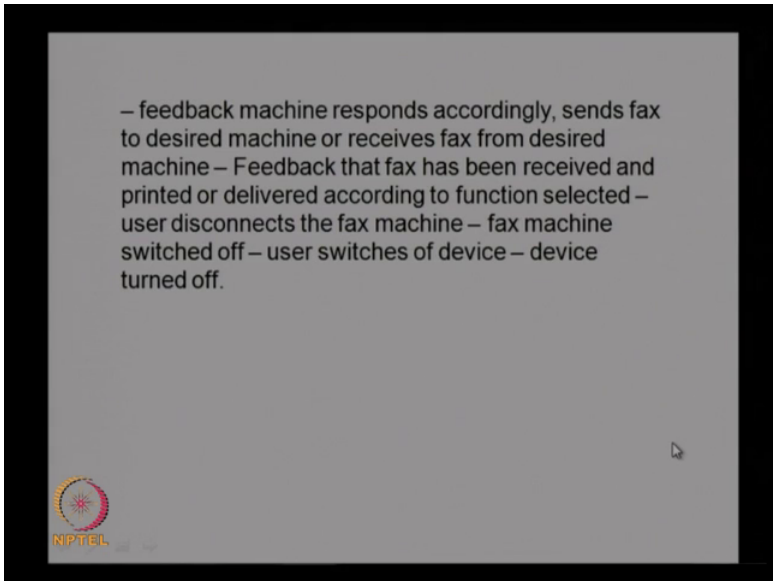

So, this is again the same, the fax service, or how do we actually identify the requirement for a fax machine, fax service, what are the various stages to be identified.

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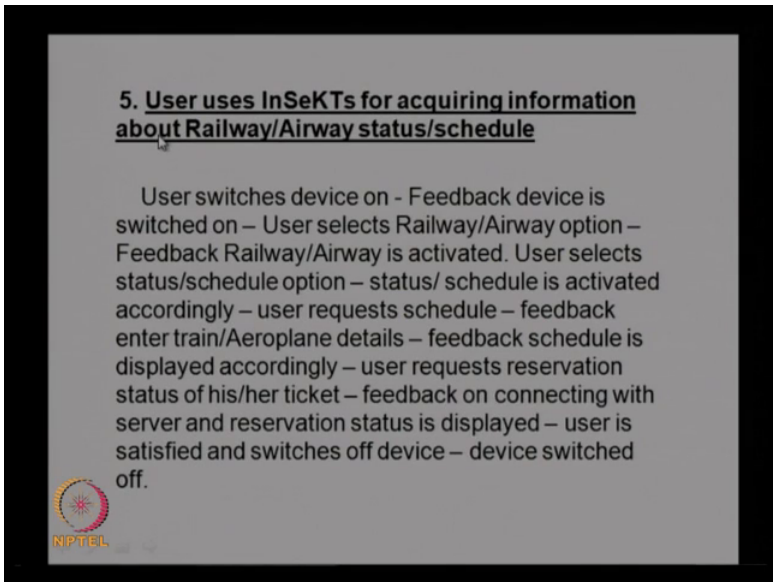

This is for the railway or airline status or scheduled information. So, here actually the user will be a selecting an option of this, available in the system, and based on that the required information will be provided if it is a paid service, then he will be asked to paid pay the money; otherwise there information will be provided to the user, and the user request the schedule, the feedback will be given about the train or a air services. And then based on the feedback again he will be giving the details and then user requests the reservation status of the ticket if it is booking a status enquiry, and then feedback on connecting with server and reservation status is displayed, and user is satisfied and switches off the device and device switched off.

So, that is the activities carried out by the user, when he is using this particular service.

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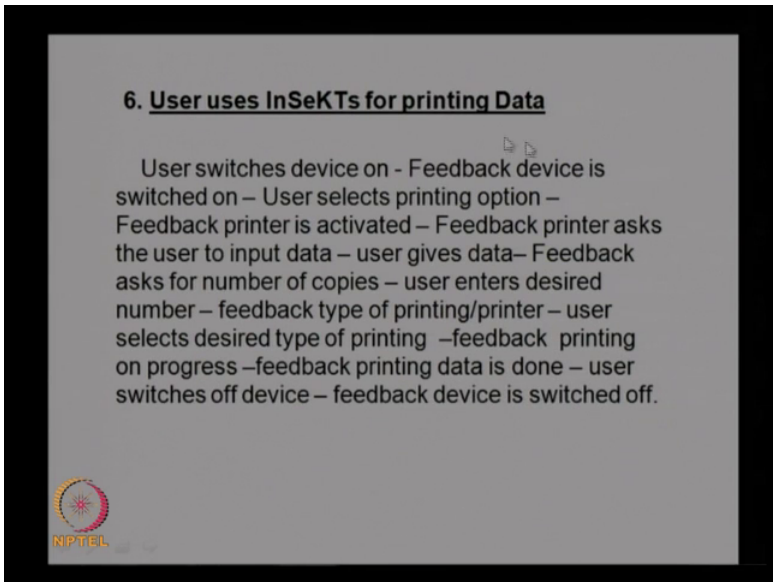

Again another one is printing the data, if you wants to print a particular data from the system, or want to make a printout from data provided by the user, again that will be a options provided by the system. So, user can select the printing option, and then there will be a feedback that the printer is activated or not activated. So, if the printer is not in operation, then there will be a feedback giving, given that printer is not available; otherwise you can actually use the printer or the feedback will be given that the printer is in working condition.

And then the input that I will be given, and then user gives data and feedbacks as for number of copies, and user enters desired number of copies, and then feedback type of printing, and whether it is a color print or black and white print that kind of options will be provided, and then feedback printing data is done after completion, and then user switch off device and the feedback is, device is switched off.

So, again some of the things can actually be combined to the printer functions, but in the initial stages we need to identify all the activities. So, that we do not miss out any of the requirements of the system. So, that is the idea of get being the all the details of that particular activity.

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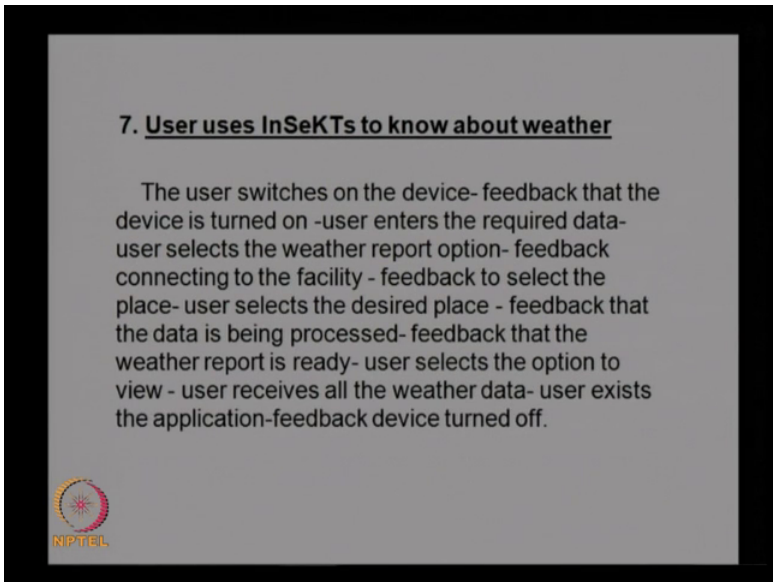

You can like this, we can actually and if I many scenarios. So, here it is about the weather condition. So, in the weather condition also the same situation of place, here actually you can give the option. So, the system will be given various options, then the user can actually give the option that he wants to get the information about the weather, and then the different options will be given, whether he wants to get the weather condition and in this particular location, or some other location. So, when he gives that information, the system will collect the data from database, or it will look at the data from a live resource available, where actually the updated information is there, and that information will be displayed to the customer and the customer will, if he is happy with the information, he will log off or if he wants to get more information, or if you wants to pay the printout of the option than he can give a print out option, and then he will be switching off the device.

So, depending on the situation whether we multiple options available for the customer or the user. So, depending on those scenarios, there will be different activities identified. So, we need to look at all the possible options and identify the scenarios, that particular scenario and then see what kind of additional requirements are needed, for those scenarios to be satisfied or to satisfy the, those requirements of the customer.

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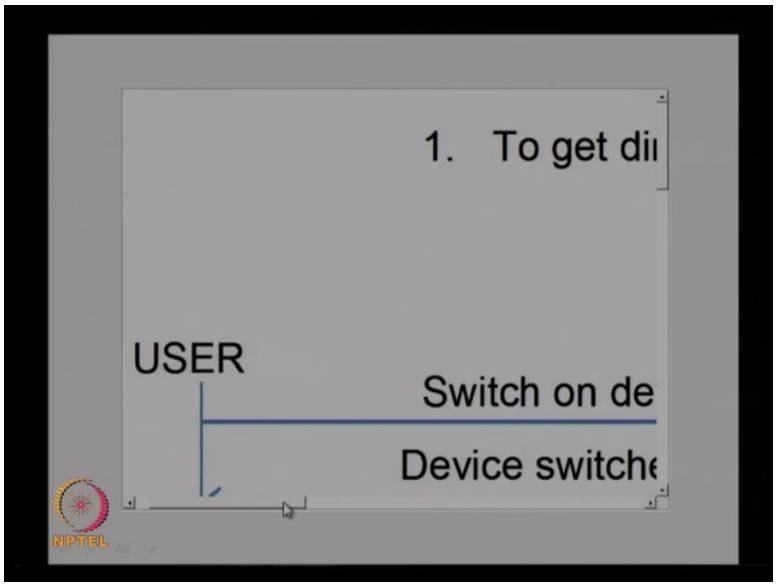

So, once we have the scenarios identified. The next time as gives basically to look at the input output trace of the scenarios.

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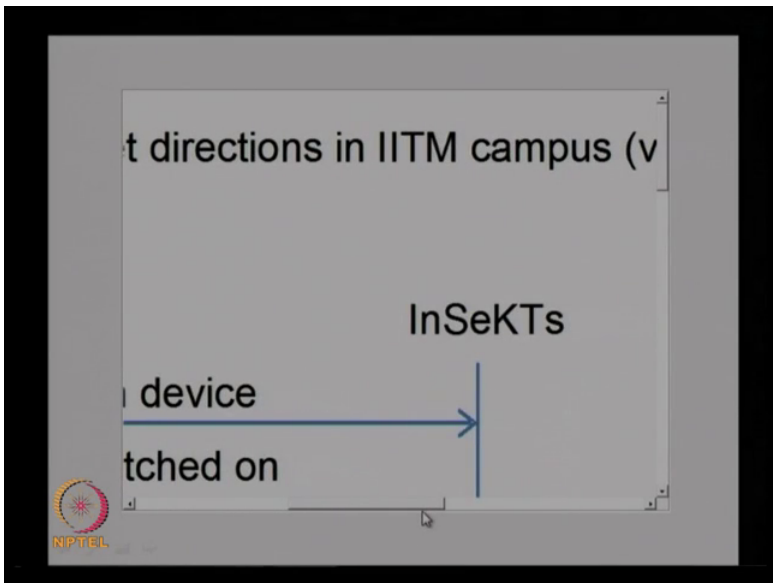

So, we discussed about many scenarios. So, we will just see how do we actually write down the input output scenario, or input output trace for the system. So, this is for the first one, where to get the directions in IITM campus. So, we can identify the InSeKTs has the main system here. So, this is the main system InSeKTs, and then we have the user here. So, user is the one which actually interacts with the system, and then will be having

an additional, depending on the situation will be having an additional external facility also like a GPS.

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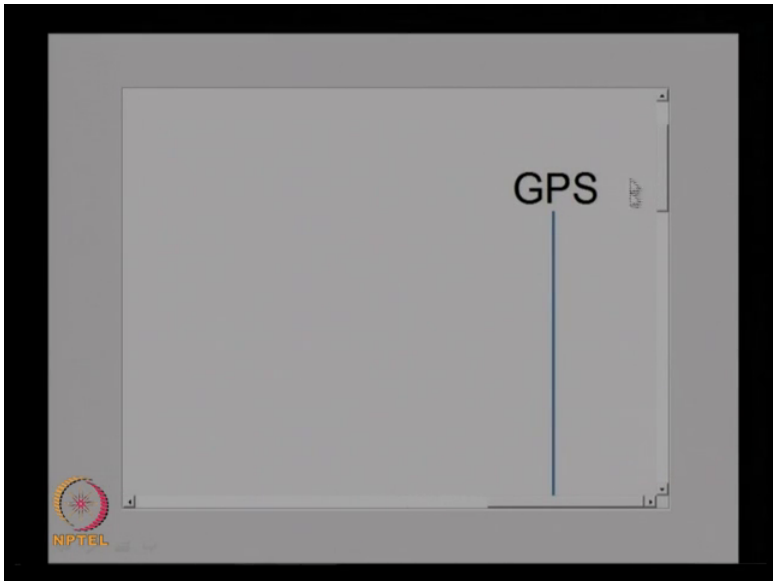

So, an external system which will be interacting with the InSeKTs, these are the three entities in this particular scenario. So, we can see what kind of input and output is going on. So, the user actually will do the switching on the device, and then we will be getting and information that the device is switched on. So, this is the input to the insekt, and this is an output from the InSeKTs. So, we can see this in output and this is an input. So, like this we can actually look at all the activities what are we explained in the previous scenarios. You can actually identify what kind of an input is coming, and what kind of an output is going.

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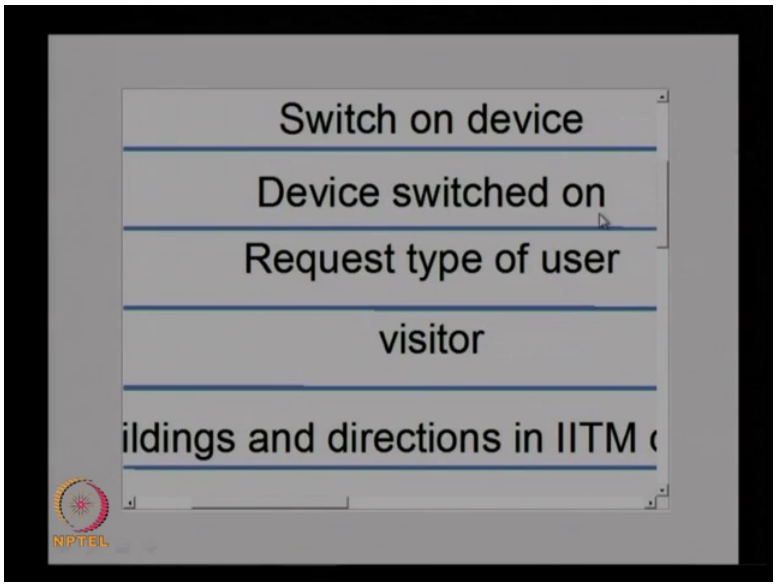

So, this is an output, again the information that the device is switched on. Then then he will request for the type of user, again the system will ask for the type of user, and the visitor will give that information as an input to the system; that is a visitor, and then he will give an option. The system will give you an output in this various options to the user, and user will select the options.

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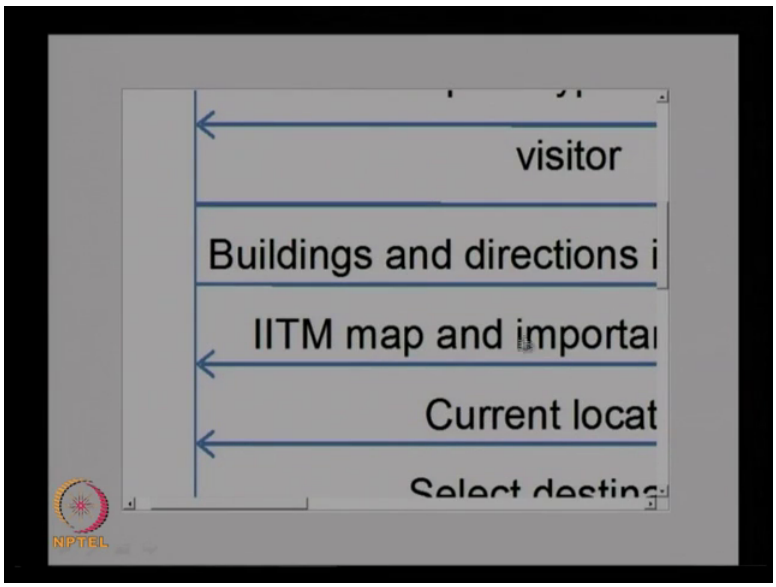

And then it will be, the data will be provided by the IITM system, the map and the other information. Like the current location will be given, and then the user can choose the destination.

So, it will ask the system to the user to select the destination, then the destination selected information will be provided, and then the all the possible routes will be displayed by the system. So, that is the output coming from the system to the user.

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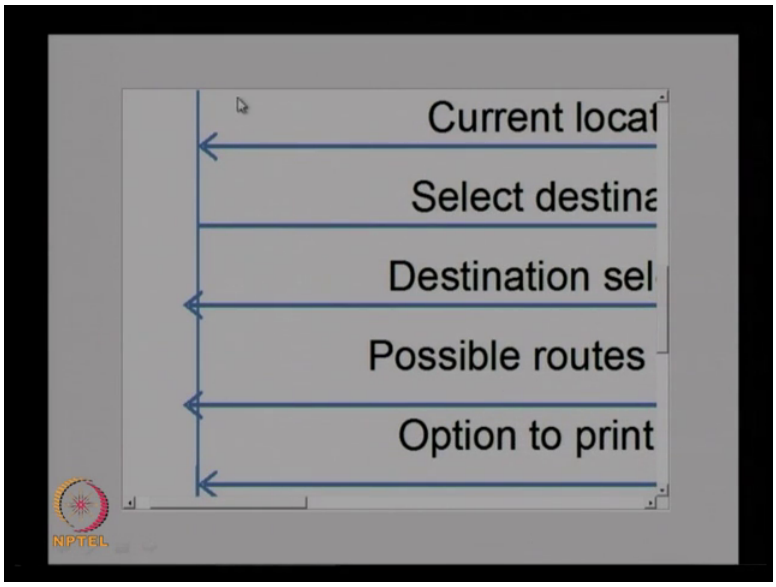

So, the arrows represents the data flow from the insect to the user. Same way all the scenarios can be traced and you can actually see the information to print map will be given by the user, then the map printed information will be given by the system.

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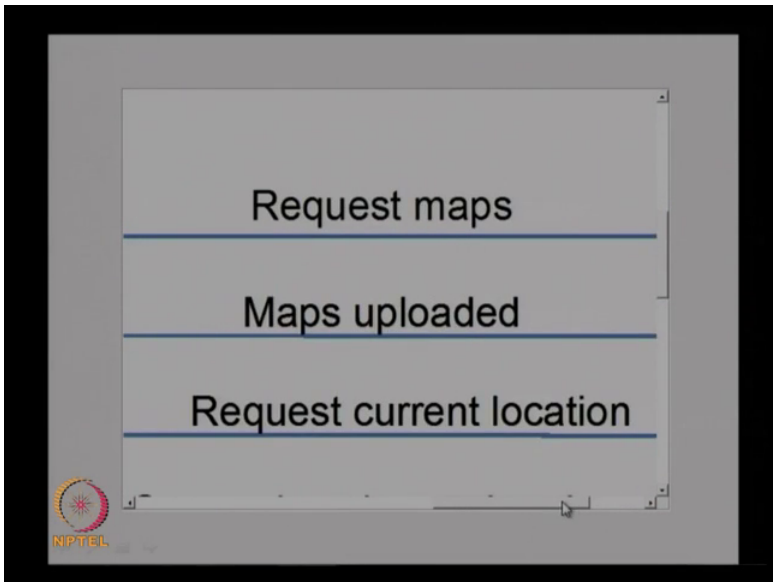

And here also you can see the InSeKTs will be interacting with the GPS system. So, that is another external system here. So, the GPS data will be downloaded, and then maps will be uploaded using the GPS data, that current location.

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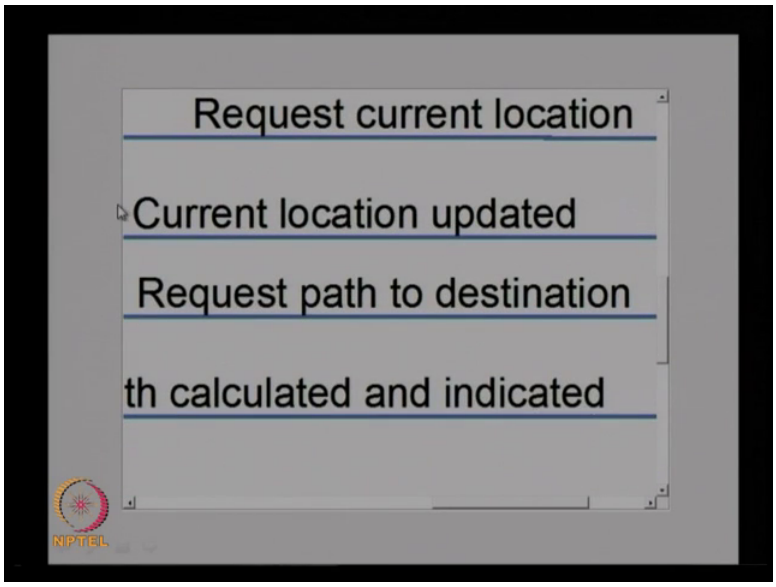

And other information will be obtained from the GPS data, and that will be given to the InSeKTs system, and then using this data the system will inform the customer about the location and other details

So, this is how the interaction takes place between the user, the system, as well as the external system the GPS system. So, we identify using this input output trace. We try to identify the type of interaction taking place between the system as well as the external systems, and then try to identify what kind of requirements are therefore; these things to happen, and accordingly we need to design the system. So, that is the importance of input output trace. We will try to identify the requirements for those scenarios based on the input and output. We will try to identify those requirements, and then write down those requirement as the originating requirements.

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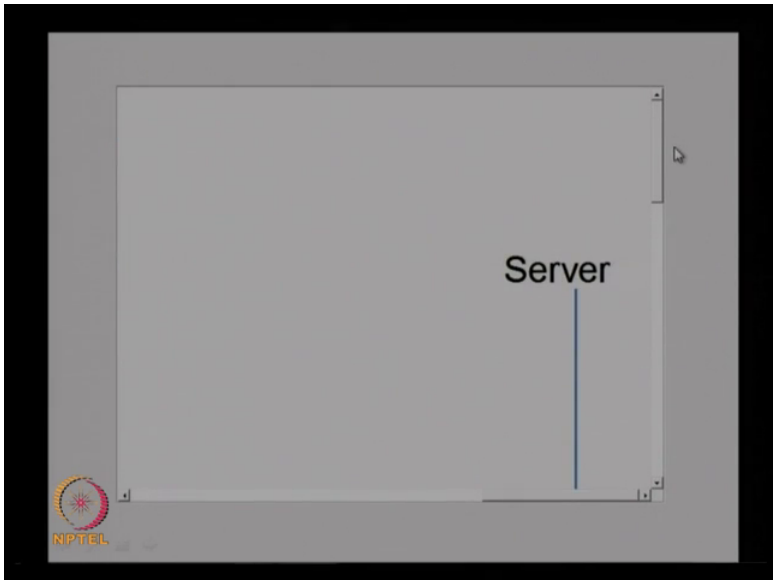

So, this is for the other scenario, you access the internet. Again if you have the scenario for accessing internet, can see that InSeKTs the system.

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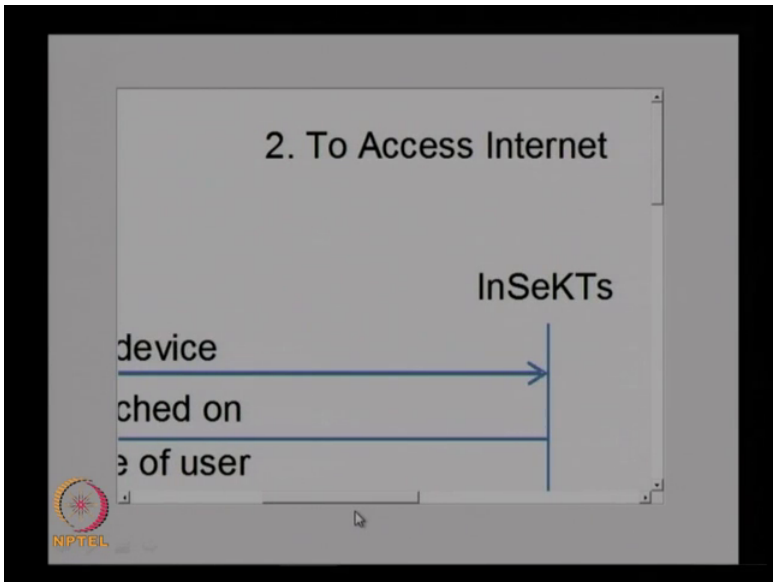

And then you have the user as the external system, and then you have the database or the server has the another system which is the InSeKT will be connected to for the internet. And here that shows that the type of inputs user gives an input, and the system gives a feedback.

Similarly, you can see that the type of person who is that the internal person, or an outside visitor, that information will be given. And then the username and password data will be requested, and then it will be, feedback will be given. Then it will that feedback about the authentication will be given.

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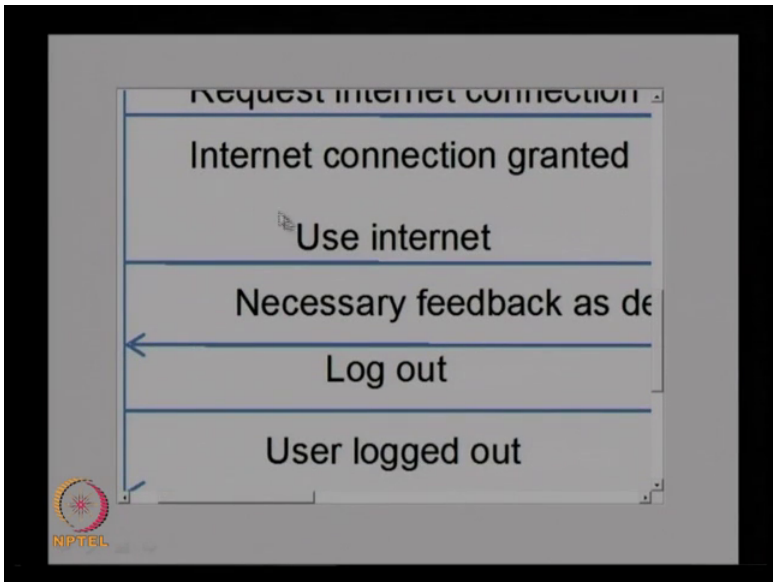

Then the request for internet connection will be given by the user to the system, and then we get a feedback that the connection is established, and then using the net by the user. Then feedback will be there, but the necessary, has about the desired functions in the internet whether you wants to do any particular activity. And once he completes the (Refer Time: 33:32) he will be logging out and then there will be a.

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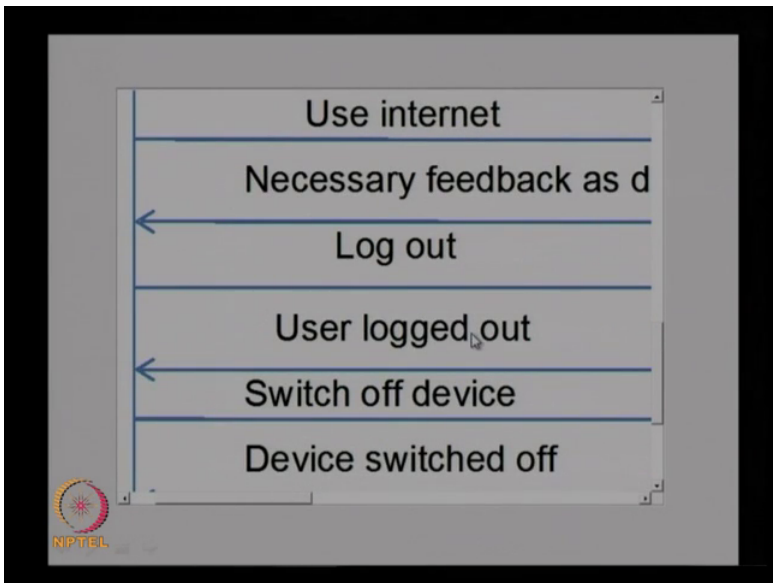

Feedback that the user is logged out, then you can switch off the device. And here you can see the interaction between the system, as well as the system with the, server will be basically to get for logout purpose.

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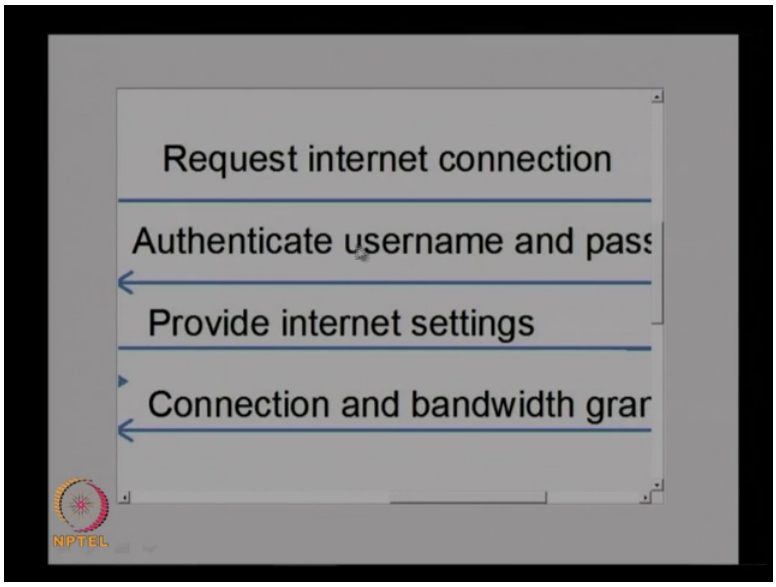

As well as for the internet connection, and the authentication of the user, based from the database, the user will be given a connection, whether this the based on the username and password.

And once it is accepted then there connection will be established, and then only for logging out he will be again connecting to the server and gets a logout from the server. So, this is how the input output trace for the second scenario looks like.

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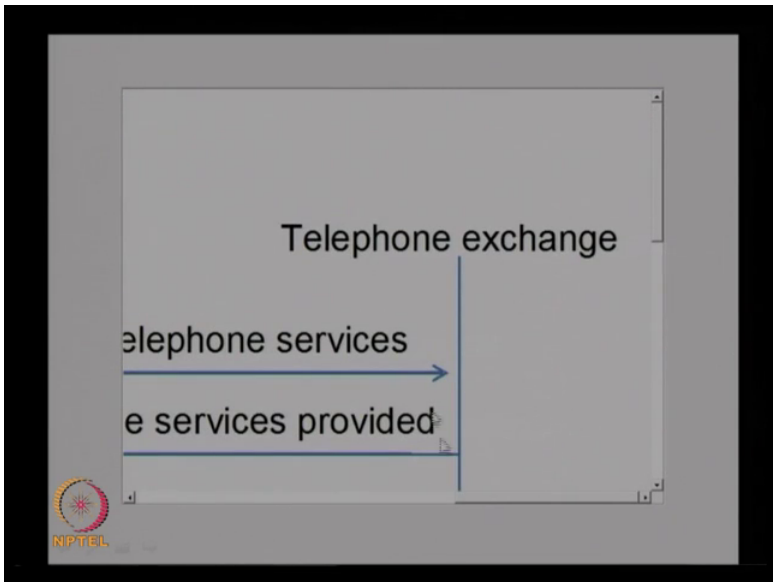

Similarly, we can actually develop many scenarios like for a telephone service. So, we can. In this telephone, making a phone call, the user is one system external system with the InSeKT, and then you have the InSeKT has the main system, and then the telephone exchanges as the external system. So, when the user gets the options, give you the option and then gets the connection, then it will be connected through the exchange to the system.

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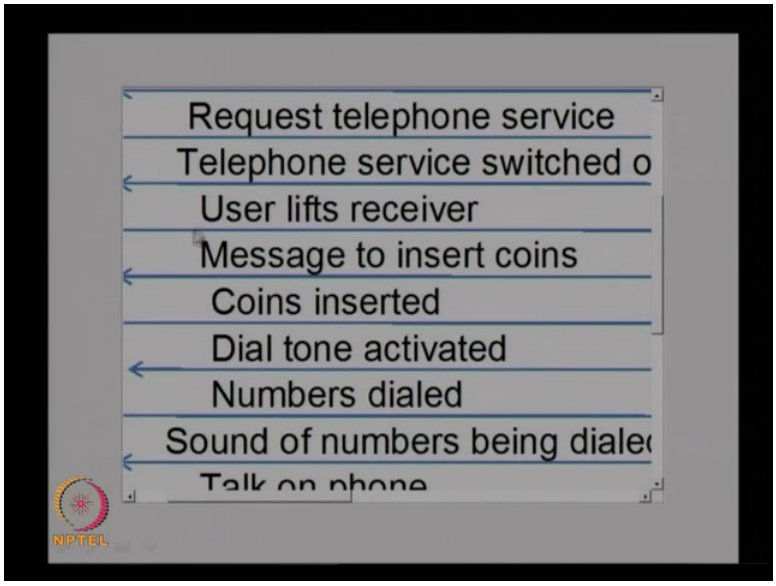

And then if it is depending on the payment options though these activities will be there. If it is not coined then it will be a card access mechanism.

So, depending on that we need to identify what kind of a interaction takes place. And once it is connected, then the telephonic, it will be connected to the telephone exchange through the telephone exchange we will be provided with the service; that is shown here.

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There will be a request for the telephone service from the terminal, and that will be established by the telephone exchange, then it will go to the next level. So, that is the, that is how the input output trace for the, this particular scenario looks like.

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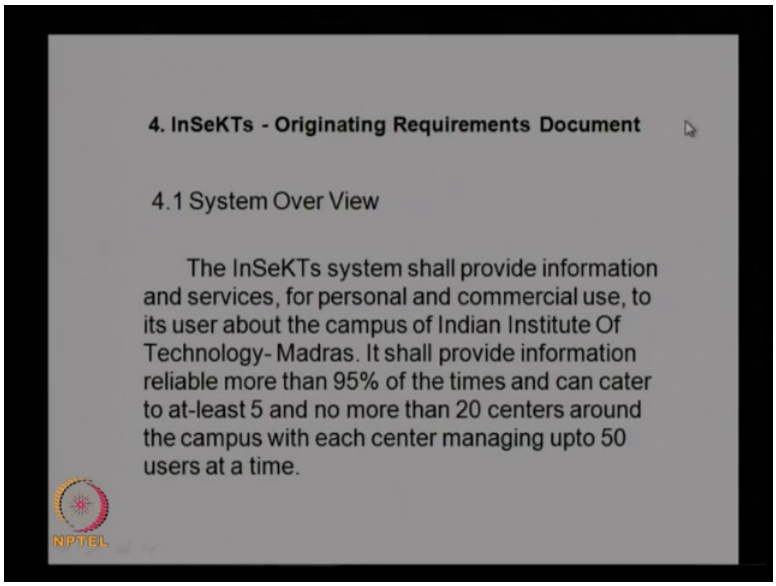

Now, once we have all these requirements, the next task is basically to write down the originating requirements document. So, various requirements like general requirements and the specific requirements, and then we find our identified the various scenarios and their input output requirements.

So, based on this we can actually start writing the system of originating requirements document or the O R D. So, in O R D we start with writing the system overview. So, we will write the InSeKTs system shall provide information and services for personal and commercial use, to its user about the campus of Indian Institute of Technology Madras. It should shall provide information, reliable more than 95 percent of the times, and can cater to at least 5 and no more than 20 centers around the campus with each center managing up to 50 users at a time. So, this is the general overview of the system. So, what is the purpose of the system, and what are the expected service standards from the system to be given as a overview as an introduction to the ORD.

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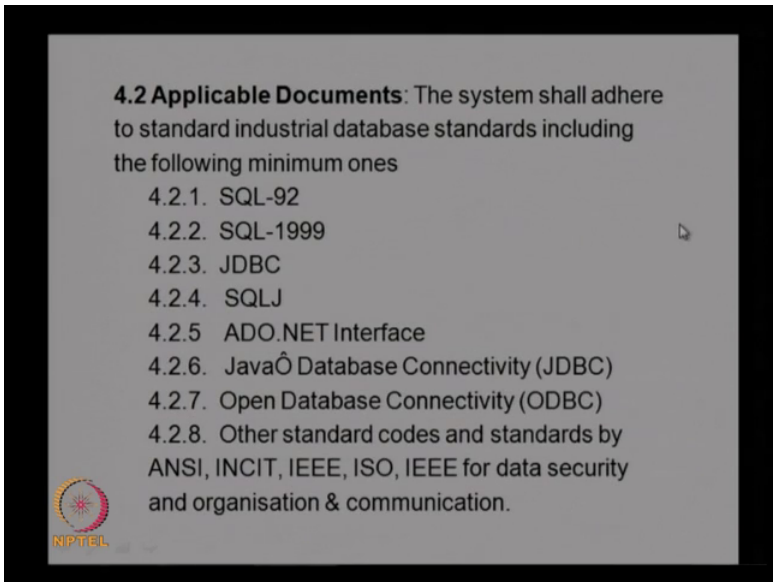

And then we will write down the applicable documents. What are the documents which are applicable to particular, this system design. So, we will look at the standards existing for various applications for communication, as well as service telephone service, and similar services, and then we will write down all those documents and document numbers and the names here, as the documents applicable to the system development.

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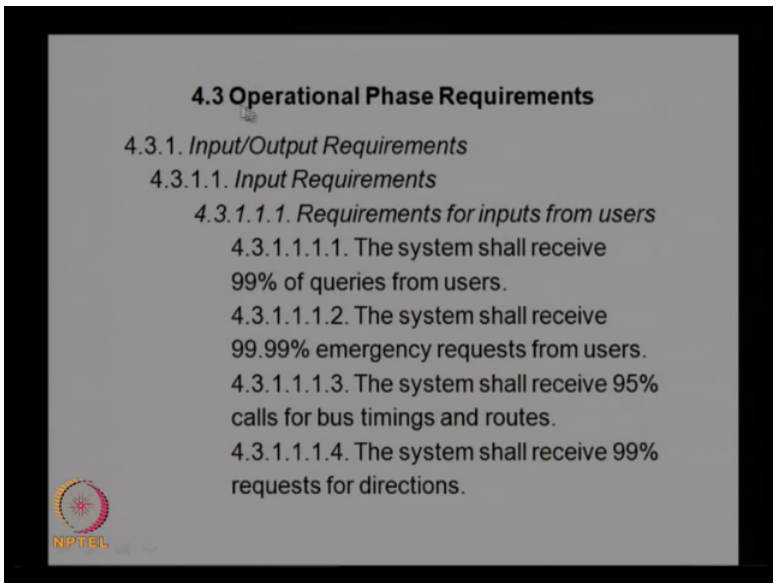

Then we will write down the operational phase requirements. So, we can actually have different requirements depending on the phase, as we know that there are various a life

cycles. So, for that those life cycle we need to write down the requirement. So, we are looking at the operational phase requirements here, the input output requirements. So, we will giving the numbers like for 3 3.1 has the input output requirements, and in this one we will identify the input requirement first, and then the input requirements for input from the users, we will write the system shall receive 99 percent of the queries from users. The system shall receive a 99.99 emergency requests from users, and the system short receive 95 percent calls for bus timings and routes, and system shall receive a 99 percent request for directions

So, these are all we identified in the specific requirements. So, that we will be, we are writing in a in the systematic way in the ORD.

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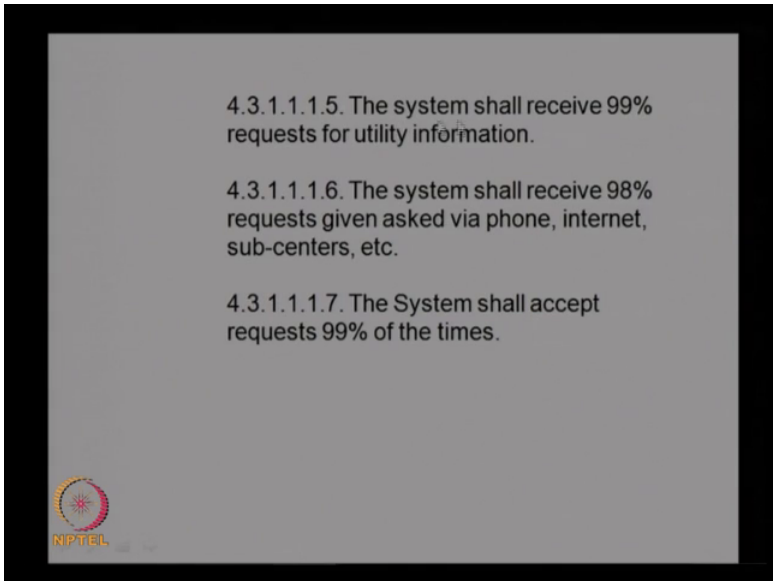

Same with the system shall receive 99 percent request for utility information. This system shall receive 98 percent request given when asked via phone internet or sub centers, and system shall accept request 99 percent of the times then requirements for inputs from the maintenance personal.

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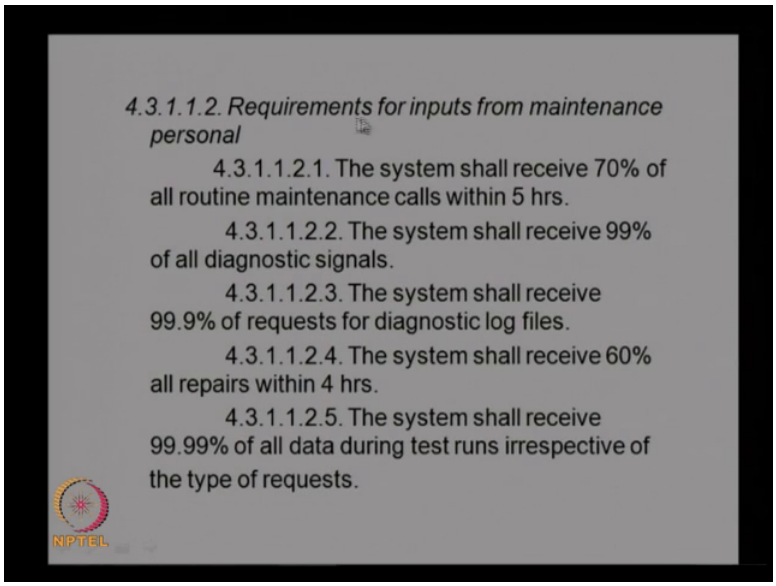

So, there will be users 99 percent or. So, there will be may be various users. So, this inputs are for the maintenance personal. So, we can see the system shall receive 75 percent of all routine maintenance calls within 5 hours. The system shall receive 99 percent of all diagnostic signals. The system shall receive 99.9 percent of request for diagnostic log files. The system shall receive 60 percent of all requests within 4 hours.

In the system shall receive 99.99 percent of all data during test runs, irrespective of the type of request then the input from primary server requirements.

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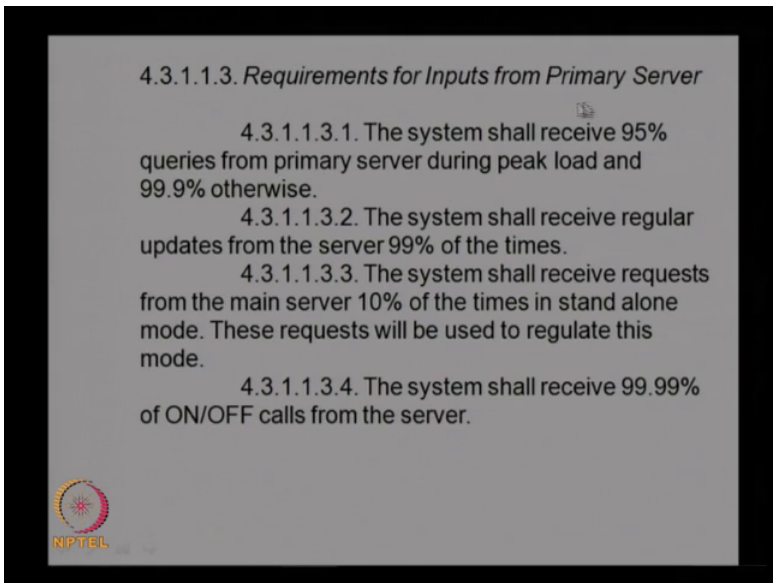

The system shall receive 95 percent of queries from primary server during peak load, and 99.9 percent otherwise. The system shall receive regular updates from the server 99 percent of the times, and then the system shall receive request from the main server 10 percent of the times in standalone modes, and this request will be used to regular this mode, than the system shall receive 99.99 percent of on off calls from the server.

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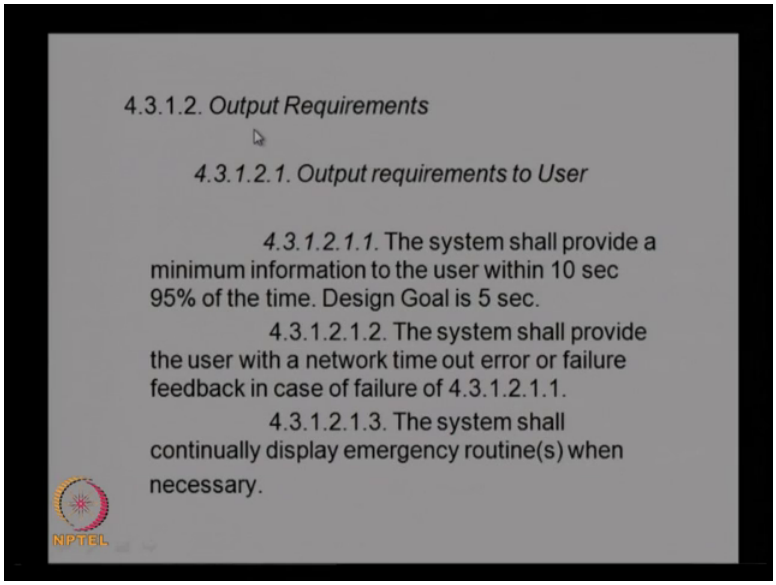

So, these are the requirements of inputs from the primary server, then the output requirements. So, what we discussed was the input requirements, then the output requirements again we can classify from the user outputs, then the maintenance personal or all other users. So, here that output requirement from the to the user are, the system shall provide a minimum information to the user within 10 seconds 95 percent of the time, and design goal is 5 second. So, or within 5 second we should be able to provide most of the information. The system shall provide the user with a network timeout error of failure feedback in case of failure. So, it should be able to give a failure. I will specify it here. So, that should give a output, like what is the other the feedback should be given about the network timeout, and system shall continually display emergency routine when necessary.

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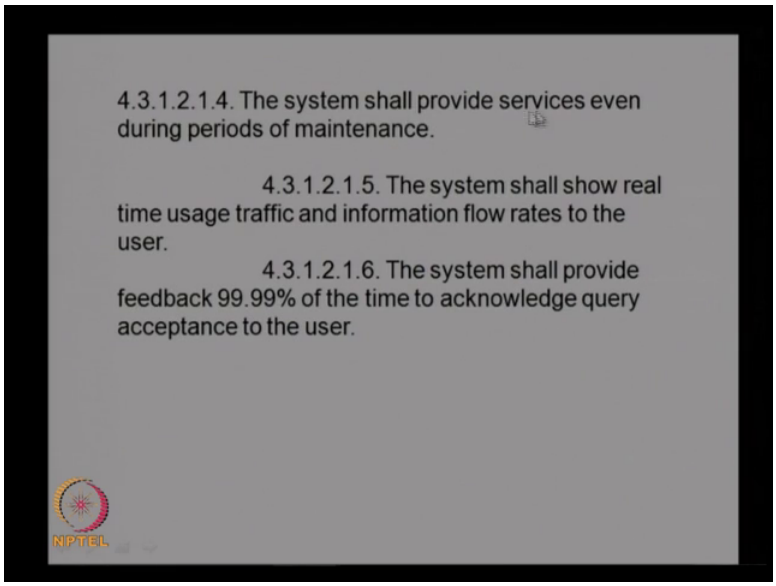

The system shall provide services even during periods of maintenance. So, that is another requirement. So, during maintenance also some services should be provided, the system shall. So, real time usage traffic and information flow rates the user, and the system shall provide feedback ninety 99.99 percent of the time to acknowledge query acceptance to the user.

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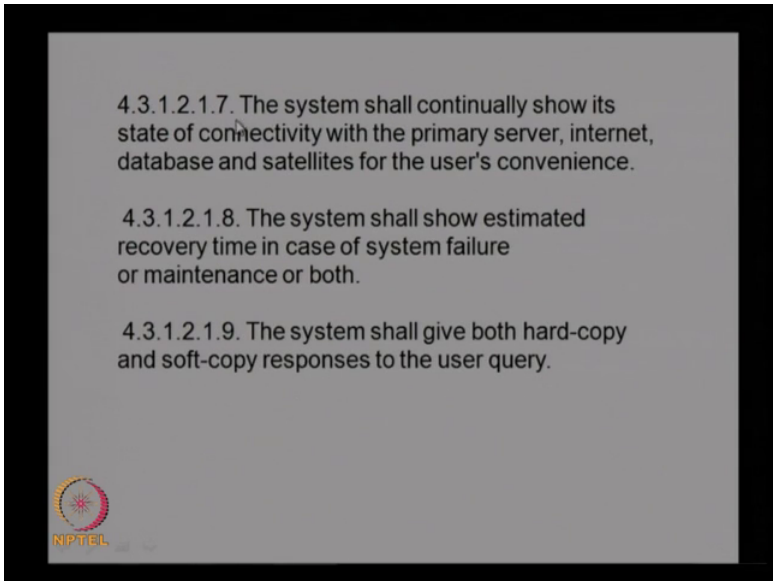

And again the system shall continually show its state of connectivity with the primary server, internet, database and satellites for the users convenience. Systems also estimated

recovery time in case of system failure or maintenance or both. The system shall give both hardcopy and softcopy responses to the user query, and depending on the response from the user, can should give a hard copy or soft copy or both.

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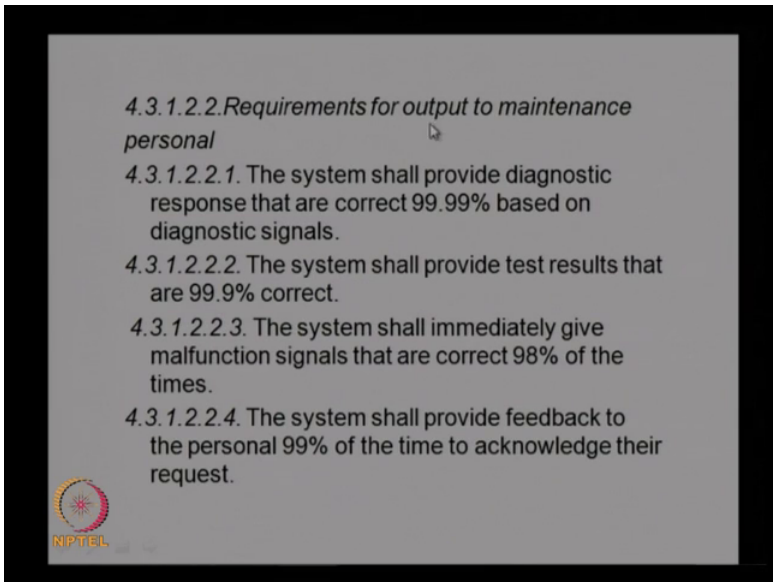

This is again for to the output to maintenance personal. The system shall provide diagnostic response that are correct 99.99 percent based on diagnostic signals. The system shall provide test results that are 99.99 percent correct. The system shall immediately give malfunction signals that are correct 98 percent of the times. The system shall provide feedback to the person 99 percent of the time to acknowledge their request.

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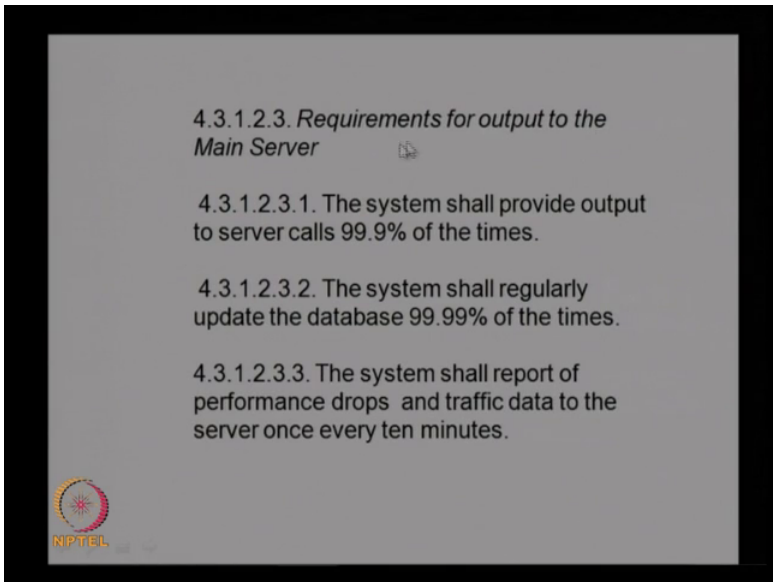

Then the requirements for output to the main server, the system shall provide output to server calls 99.9 percent of the times. The system shall regularly update the database 99.99 percent of the times. The system shall report of performance drops and traffic data to the server once every 10 minutes.

Again this is actually depends on the designer about the 10 minutes. So, depending on the request or the service requirements, this can actually be decided by the designers.

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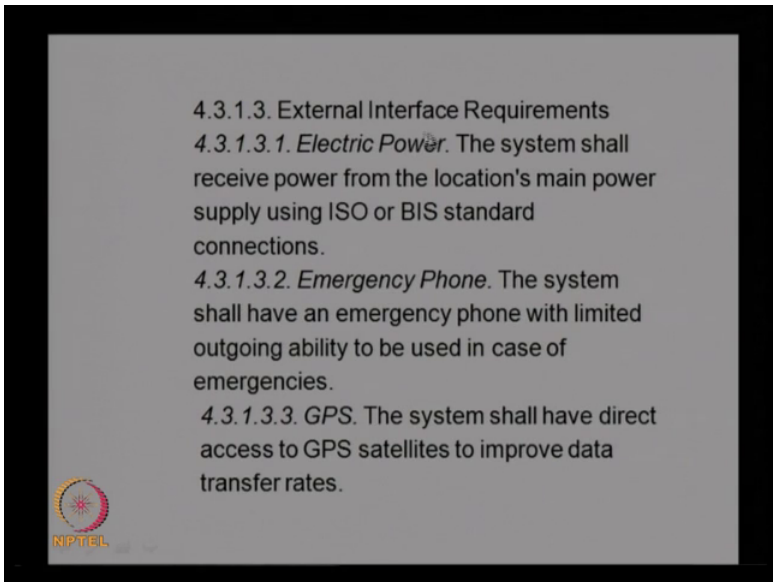

And the external interface requirements, the system shall receive power from the locations main power supply using ISO or BIS standard connections. Then emergency phone the system shall have an emergency phone with limited outgoing ability to be used in case of emergencies. Then GPS, the system shall have direct the access to GPS satellites to improve data transfer rates.

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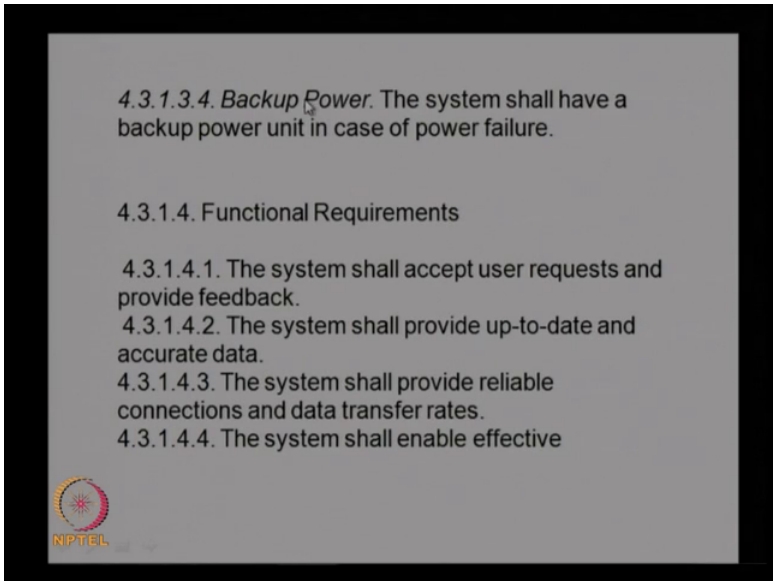

Backup power requirement, the system shall have a backup power unit in case of power failure. In the functional requirements the system shall accept user requests and provide feedback, the system shall provide up to date and accurate data. The system shall provide reliable connections and data transfer rates; the system shall enable effective maintenance sorry.

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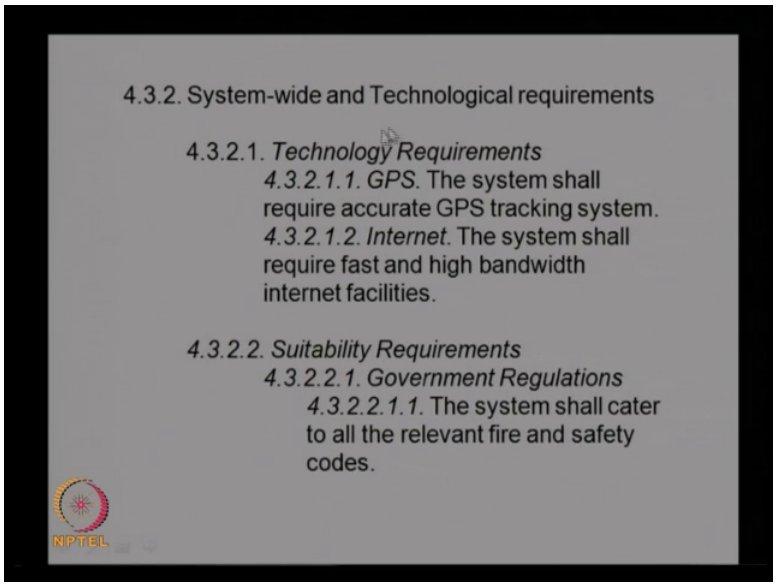

And technology requirements; the system shall require accurate GPS tracking system. Then the internet the system shall require fast and high bandwidth internet facilities. Then the system shall cater to all the relevant fire and safety codes; that is the suitability requirement for the system.

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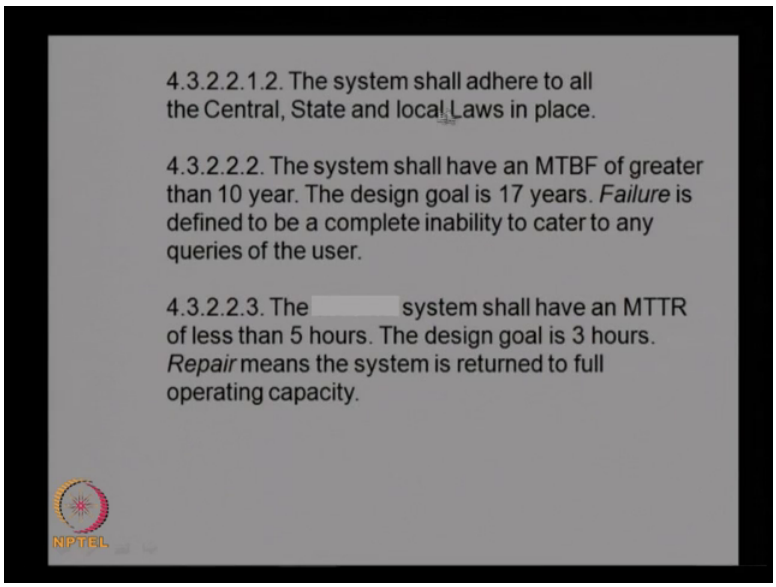

In the system shall other to all the central state and local laws in place. The system shall have an MTBF of greater than 10 years the design goal is 17 years. The failure is defined to be a complete inability to cater to any queries of the user. The system shall have an

MTTR of less than 5 hours; the design goal is 3 hours. Repair means the system is returned to full operating capacity. So, within 3 hours or within 5 hours system should be able to bring to the normal operating modes.

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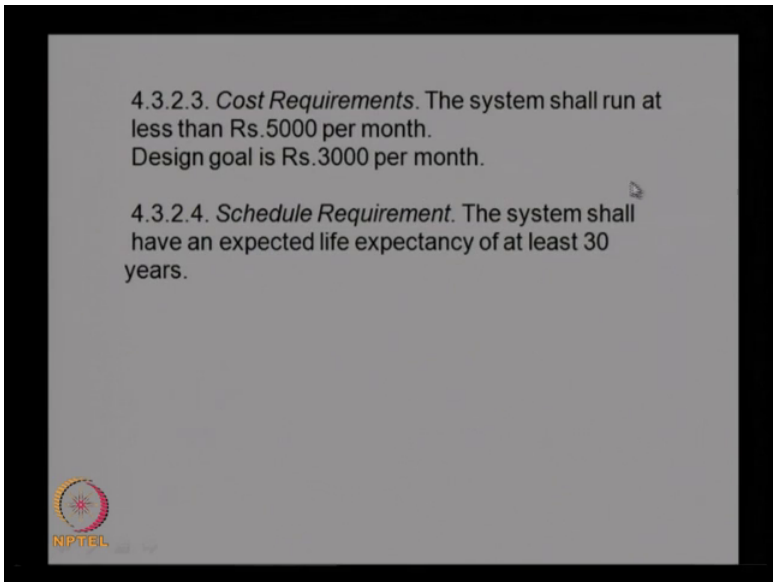

The cost requirements, the system shall run at the less than rupees 5000 per month, the design goal is rupees 3000 per month. The schedule requirement the system shall have an expected life expectancy of at least 30 years; that is the life expectancy requirement. So, once we have this. So, we need to go for the functional decomposition.

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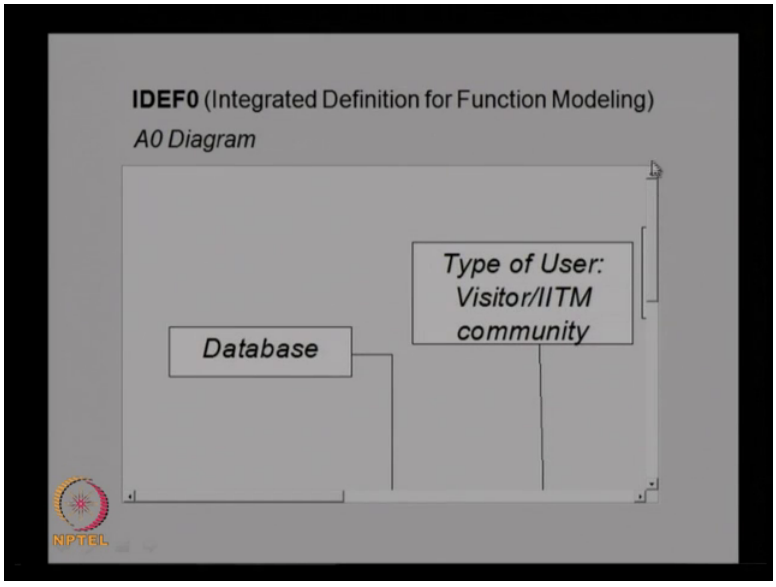

So, what we discussed so far is about the requirements identification. And once we have all the requirements identified, we will go for, the originating requirements documentation. ORD we will write down all those requirements whether is a input output requirement, system biotechnology requirement, or the functional requirement, all those requirements will be recorded in the ORD or in terms of the life cycle.

So, for the operational phase, the retirement phase or the maintenance phase, we will identify all these requirements, and write down these requirements and as the originating requirements document. So, that is the first stage or of the development of the system. In the next stage based on these requirements we will go for the identification of functions to be provided in the system. So, this we will do through functional decomposition. So, we discussed about many methods for functional decomposition. Like Hately Prirbhai template, and Idef Zero Diagram.

So, we will use the Idef Zero Diagram, and then see how actually we can decompose the main function into small functions, and identify the small functions to be provided in the system. So, this we will see in the next class. We will look at the functional decomposition and then developing the functional architecture, as well as the physical architecture, and then developing the system. We will look about the details in the next class. So, till we meet goodbye.