Spatial Informatics
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Lecture – 10
Spatial Web Services - Demo

Hi. So, we are discussing about Spatial Web Services. So, last few lectures what we have seen that what are the different aspects of spatial web services and also how it helps in interoperability and exchange data between heterogeneous data sources. Today we will have a small demo of the thing so that it is with some open source tool, so, that it will be clear that how things works. So, if you recollect, so, we discussed about shortly about GML: Geographic Markup Language, a variant of XML or basically XML constraint. And, with that we have seen two popular web services: one is map service or Web Map Service or WMS another is feature service or WFS: Wave Feature Service.

So, what we will do today? We will see that how this can be realized right, like how the how I can extract data, how I can display data, how I can extract and some feature sets etcetera. So, whatever we have seen in last lectures today we will see a short demo. So, just I need to tell you this is not a first of all full face operational things, it is more of a demo type of things. And, we have taken some synthetic case, but it works pretty fine, the same thing will work if you take a real time data. And, we have used some of the open source tools and some resources from the internet for specifically for the purpose of this discussion right.

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So, what we will do? What we have seen so far that by using spatial web services we address the interoperability issue. We have done some of the this GML related things, what is GML that also we will see and with that spatial web services service model and some visualization of the GML. And, before we start with me I have Mr. Arindham Das Gupta who will be who has who another team members Jaydeep and Shreya they have prepared this demo PPT; not only the PPT the GML overall the demo itself and, Aridham will be primarily showing the different aspect of the demo right.
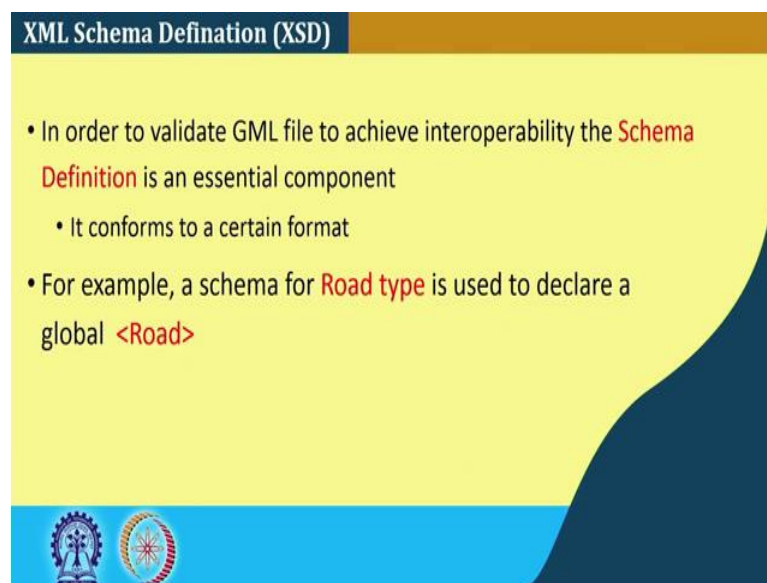
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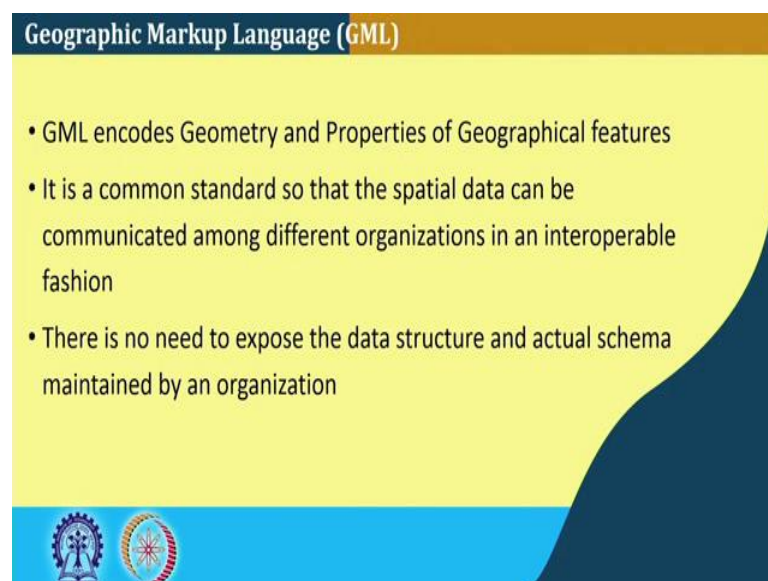
So, we will go so just to recollect GML encodes geometry and different properties of geographical features as if you recollect. It is a common standard or what we say that it is a de facto standard for any data exchange, specifically spatial data exchange. And, as we have seen it is based on XML which is a primarily for data transformation language so, that is based on that.

So, it is a common standard that spatial data can be can communicate among different organization in an interoperable fashion. There is no need to expose the data structure actual schema maintained by the organization. This we have in our previous lectures we have mentioned now and then, that the best part is that my own operational that what tools I am using, what sort of structure I am using that need to not to be expressed, only the interface need to be defined right.
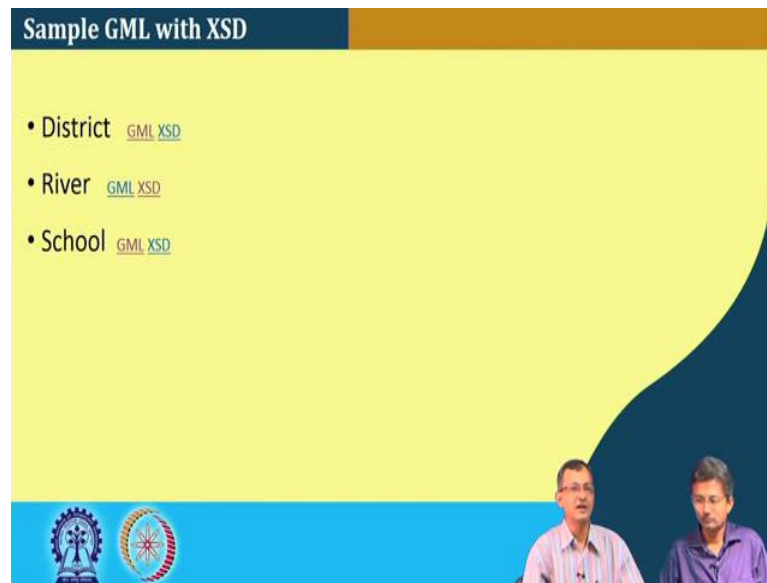
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So, also XML GML is based on a schema that how to define the structure that is XSD; again if you recollect the lectures you will remember. So, which have a Schema Definition is a essential component I defined that what those structure and for example, Road type is declared by a global road schema.

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So, there are different so, we have taken some sample GML like district, river and school. So, one if you see that one is something district is a feature of polygon, school is a line and a sorry river is a line polyline and school is a point. So, this three type of features what they prepared. Now, I request Arindham to discuss, tell about the things right please.

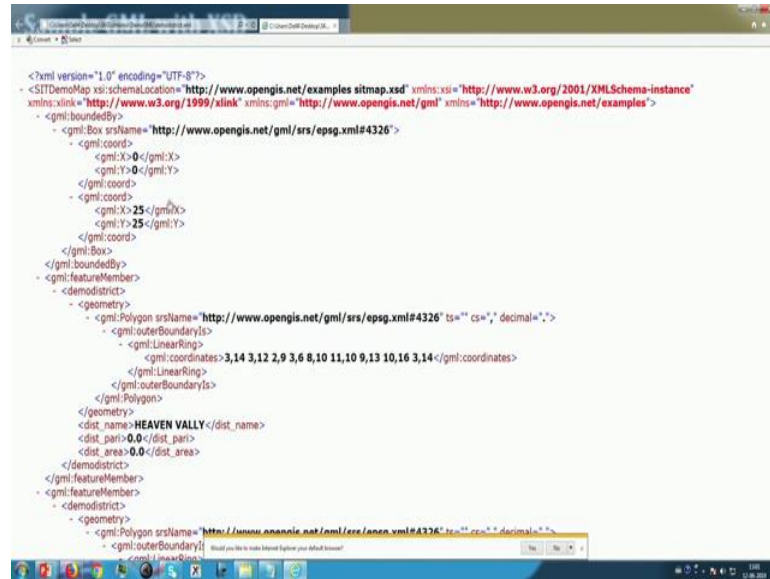So, that first is the district that polygon district.

The first is the district.

Polygon feature.

It is a polygon features.

Now, this is the GML of polygon features.

So, this is a typical GML of a GML polygon feature or of the or the district feature.

District features.

You can just broad this.

This is the GML file, it is like our database table just like the attributes of the trip this is the one attribute is mandatory; this is called geometry this is the geometry attribute. Since, it is a polygonal in nature that is why the coordinates is formed here. It is a basically a particular object because all GML applications captures the object relational database basically, not exactly totally relational database.

It contains the attributes all attributes in relational form, only geometrical attributes in form of object. That is why the geometry is an object and it in this object the coordinates of the geometry is shown here. This is x y this one is 3 is x coordinate, 14 is 14.3 is y coordinate and 3 is again x coordinate and 12 is y coordinate.

This is the continuous polygonal coordinates and its and attributal data is 1, the district name is HEAVEN VALLY. This is the hypothetical district and the perimeter is now showing here. Do you we can update the this thing later and there this GML contains three districts.
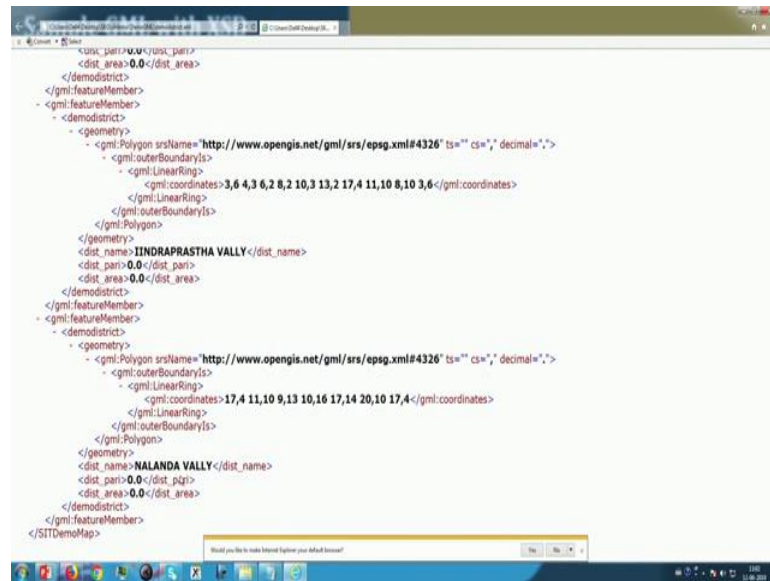
One is HEAVEN VALLY, another is IINDRAPRASTHA VALLY and another is NALANDA VALLY. All three's are hypothetical district and it contains three types of three geometries and three names. This district name is basically attributal data or normal relational data. And, these thing is basically object data and these object and this attributed data construct the actual object relational table basically. And, this is only the basically data format and the schema of this table or this GML file which one I will show you the schema actual schema it will show in XSD form.
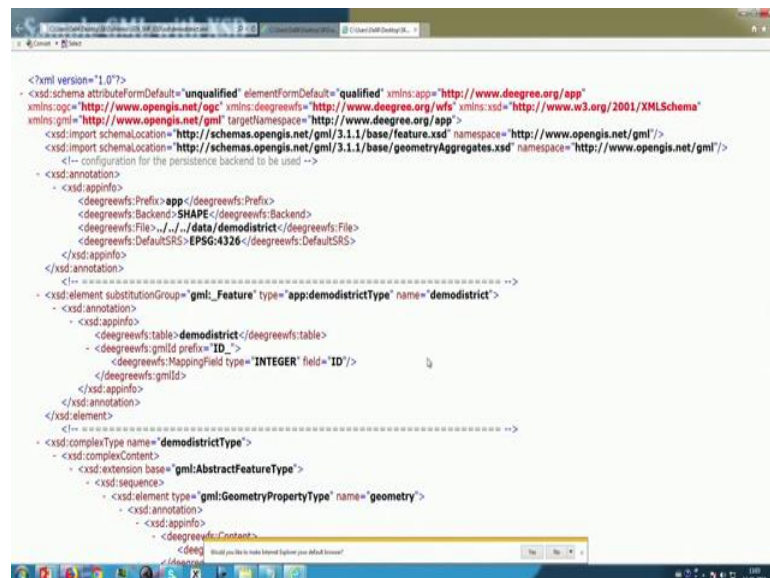
This is the XSD of that district GML, you see this is the there are lots of element XML elements here. The basic base element complex data type is demodistrictType this is the data actual data type. And, these data type contains these data type contains the actual attributes, first attribute is the GEOMETRY.

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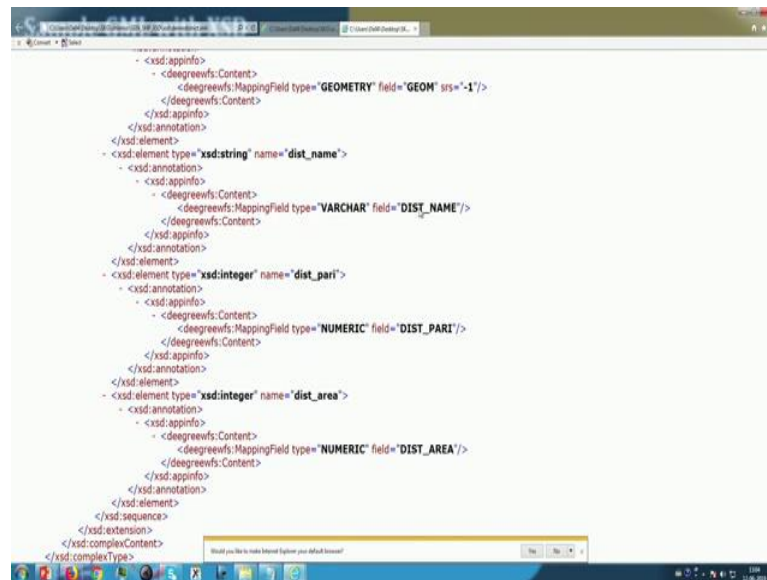
And, the field name is basically database field name is GEOM basically it is stored this in a basically actually relational database stored in back end. It retrieves the data from the database in GEOM format actual from actual data base. And, there these geometry is the after fetching the data it will show in form of GEOMETRY, it would not you can hide this field name actual database field name with the GEOMETRY field or we can rename this field. So, that we can you can hide the actual database field name to the.

External one.

External one and then another name another attribute is district name these data type string or textual format. And, in database it is basically VARCHAR and field name is DIST NAME acting in the actual database. And, our field name is district perimeter, it is integer type and district area it is integer type. We can change it change the type as you wish. And, this is the district schema and they before defining the district schema you have to mention the what is the your EPSG thing. EPSG means what is the reference point of your coordinate system.

So, as we have discussed the Spatial Reference System: SRS is the EPSG some coordinate system is defined.

Right.

Like not may be a coordinate system so, EPSG is a right.
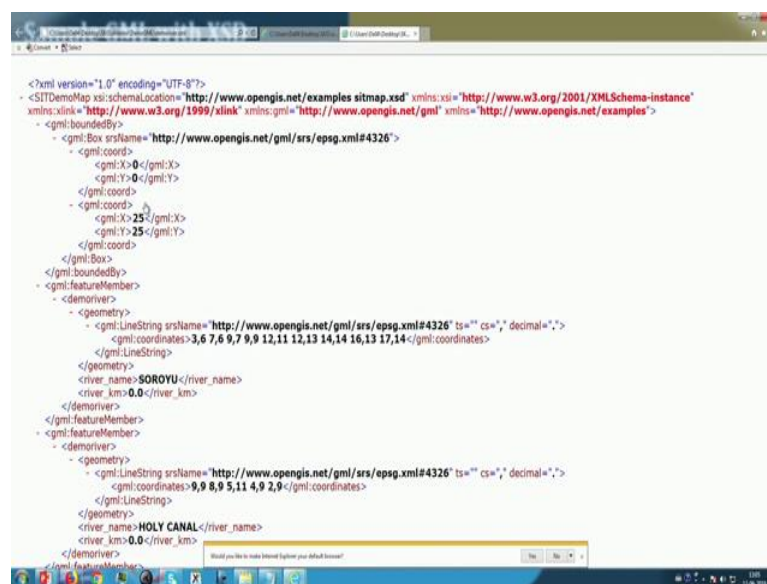
And this is the district schema; similarly I will show the.

Minimize.

For river.

For river this is the GML file.

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Same as above some slightly different from the polygonal schema. It contains the geometrical attributes. Since, it is a line it is a line type of feature that is why it is showing the line features in x y format. But, in this case the last point is not similar to here last point is 17 comma 14 and 3 comma 6, these are the starting point. In case of polygonal feature the last point and first point should be same. And, these are geometry of the LineString and this is the name of the river SOROYU river and the distance is kilometer. Now, it is it should be updated and is 0.0.

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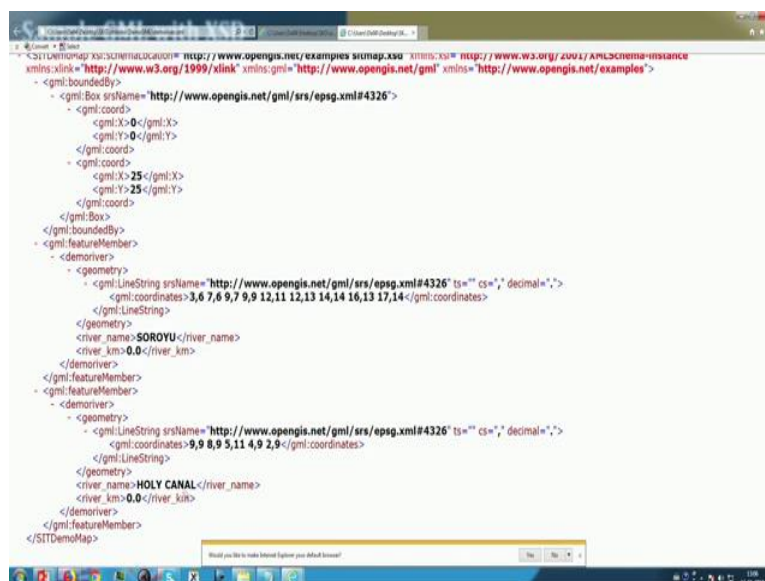
And there is another river that is called HOLY CANAL this is not exactly river, it is canal type of thing. All are in terms of spatial data, all are basically drainage systems in part of drainage system. And, these the canal is very small that is why only three coordinates here and this is the GML of the river feature and the it is schema is like that.

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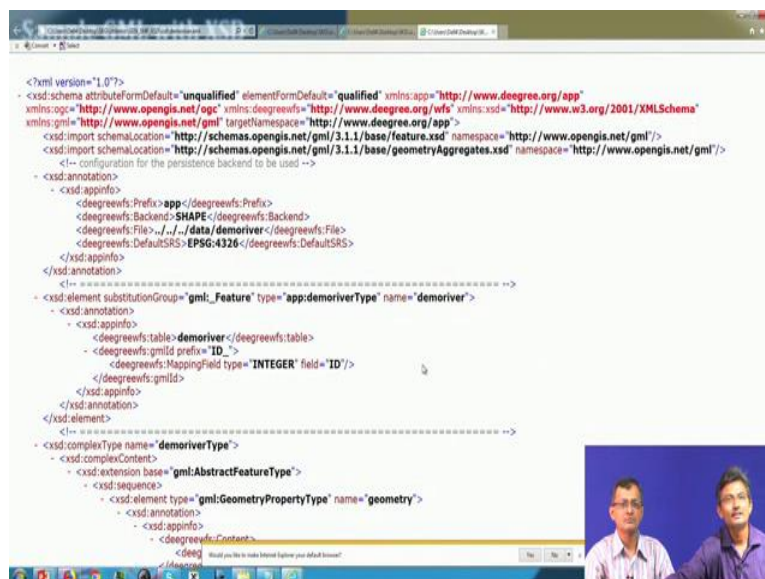
Similarly, this is the schema, same EPSG reference point and the data type is basically demoriverType. And, it is the structure type of format and it is part one member is geometry, this is the essential member of according to GML.

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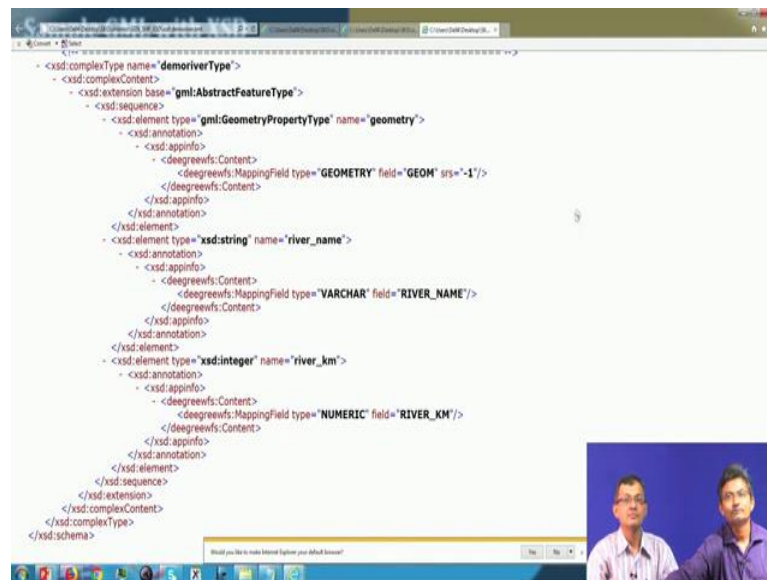
And, other the geometry is geometry feature is the essential part of any XSD which relates with any GML file. And, this is the and others the attributal data we can you can change, you can put any attributal data. But, it is mandatory this things gml GeometryPropertyType this is the mandatory, that is why we put the name space here the gml and is the abstract type is gml.

And, the river name is river attribute name is river name. Another attribute is river kilometer basically it is numeric and it is the string structure [FL]. And, this is the point type of feature its school feature it is this point type of feature.
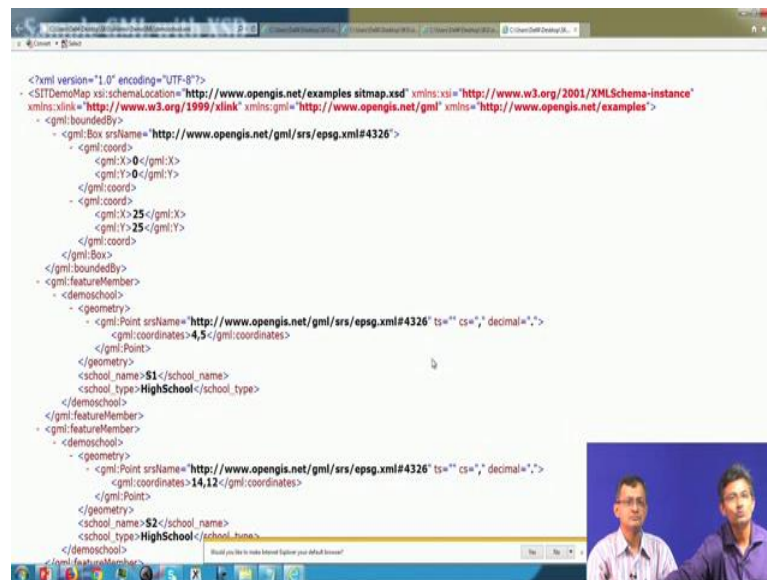
It contains its geometry contains only two points x and y coordinate system. There is a two school: one is HighSchool, the name is S 1 and the it is coordinate is 4 comma 5 x is.
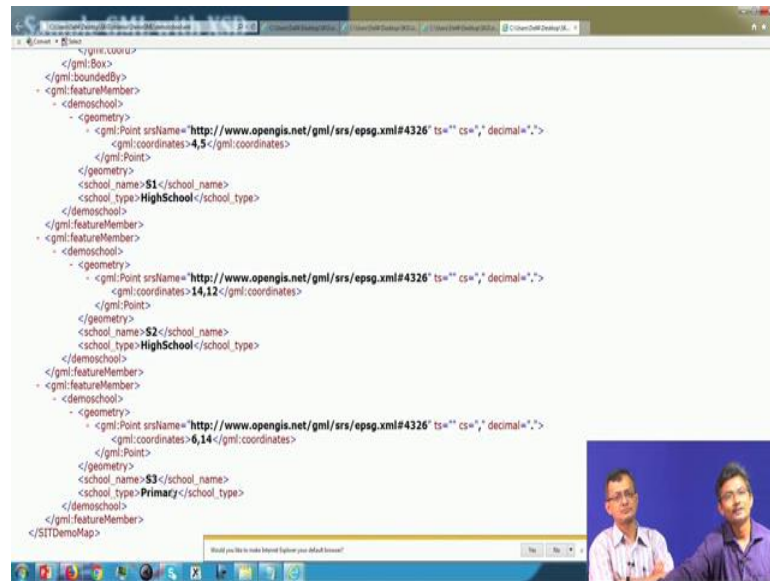
Two high school and so.

Yes HighSchool.

S 1 and S2.

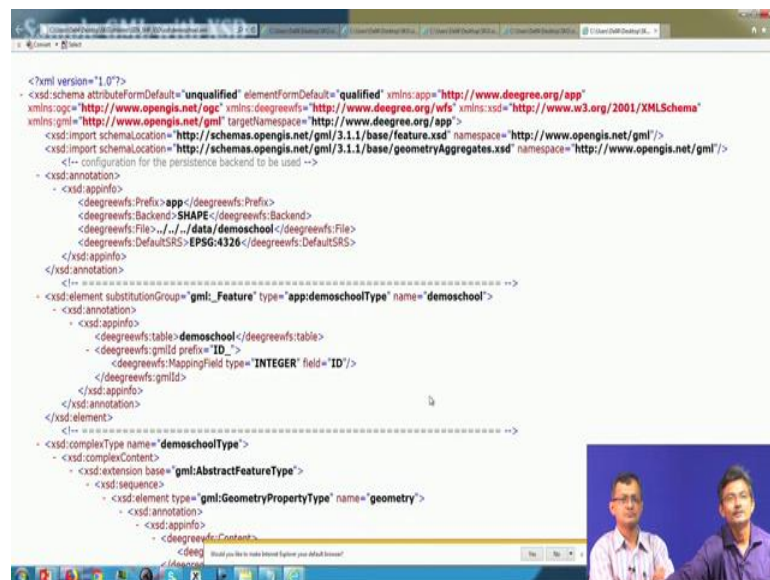S 1 is a S 1 is HighSchool and there is two high school and one primary school.

And, its Primary school coordinate is 6 comma 14 and HighSchool two high school one is 4 comma 5 and another HighSchool is 14 comma 12. I will show the actual schools on map in later.
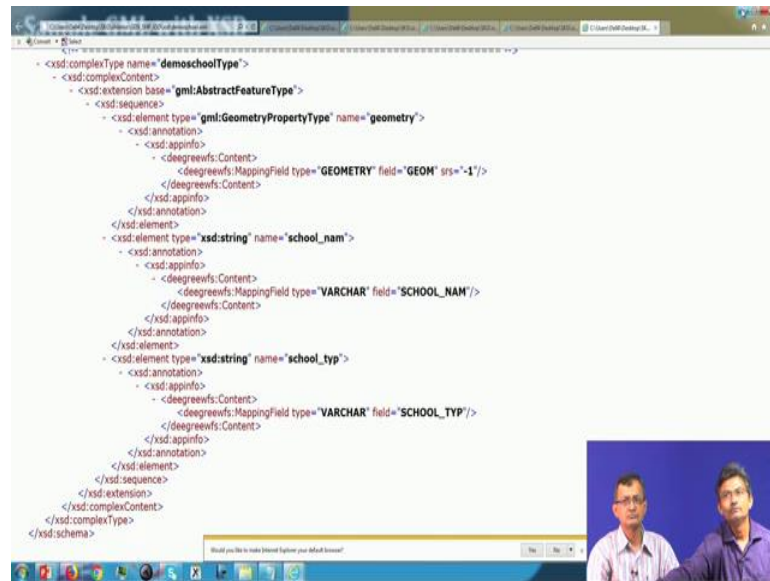
Minimize.

The XSD of the school GML is like that, this is the XSD of school data type and the data type is demo school.
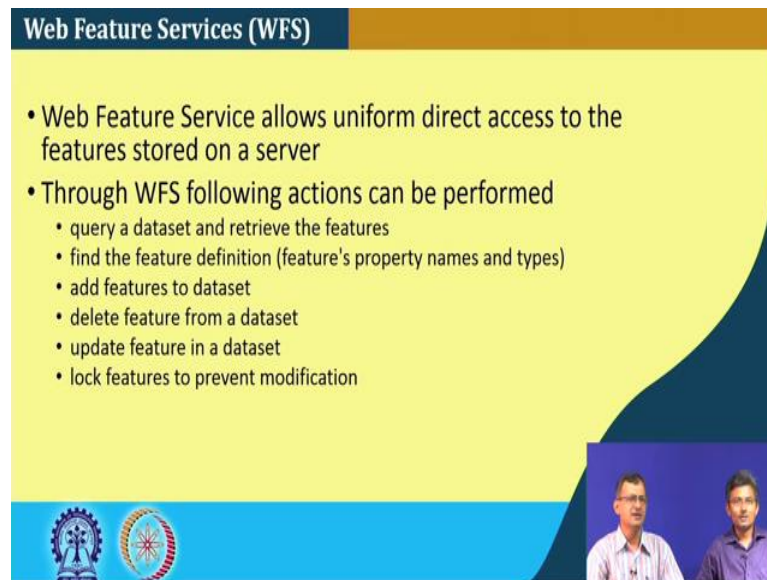
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And, its members are one is school name another is GEOMETRY and school type; this is the members of school geometry school type sorry.

So, what Aridham described here that we have three type of objects. One is district object which is a polygon, every and another river polyline and school point right. So, by these three we can represent any type of stuff right and two things are there; one important thing is that every such objects has a geometry and this is a spatial objects and it has a some attribute to it right. River has a name, district has a name, districts has a population etcetera.

All school has a coordinate which is geometry whereas, school is has a type. So, those are defined can has to be there. So, GML contains the data, XSD contained the schema as we understand that while, the I can basically exchange the XSD or even publicize the XSD. So, others who want to cooperate or a wants to access my data can know that what sort of data I am having right. So, without actual data into the thing; so, it defines the structure of the things.

Now, I think he will continue with the other things like web feature service again. We as we have described it is allows uniform direct access to the feature stored on a server; that means, I get the features set right. Through feature following action can be performed like query a dataset, retrieve features, find feature definition, add a feature, delete a feature, update feature, lock feature to prevent modification.

As we have seen that lock in the WFS when we discussed about WFS there is a lock service, lock and unlock service which can prevent modification. Some of the things I may not want things to be modified by the external stakeholders. So, that can be locked so, I have a control over the other things right.
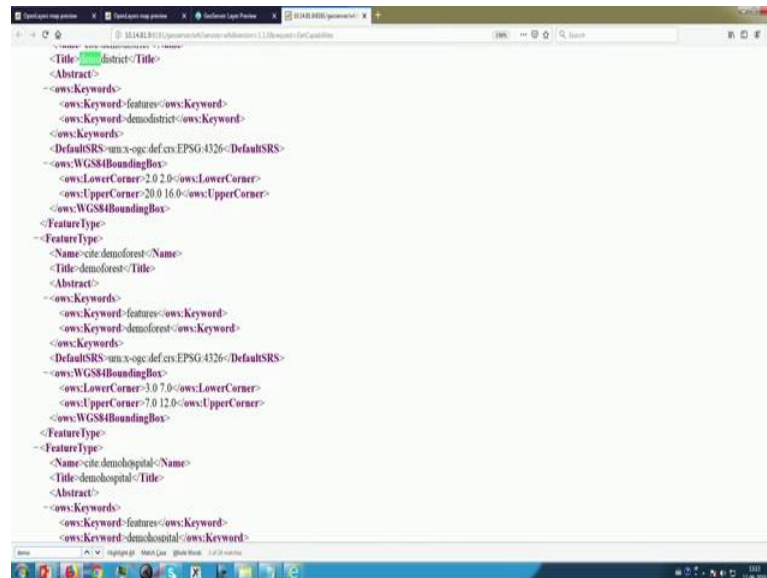
Right.

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And, now there are WFS different type of request, again if you remember we discussed about this right. WFS capability describe and feature, now again I request Aridham to look at the those things right; so, WFS capability.

Let suppose any service provider offers geo spatial features in their service portal, at first any external viewer search what type of the features available in that portal. For that we have to use one standard link is this is (OGC standard link, it is called get probability service. Through get probability service we can any machine or human being can able to know what type of features available in that portal. And, that portal may be connects with multiple database or multiple organizations it is possible its in this way we can achieve the actual interoperability of the geographical features and get probabilities. Now, see.

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So, that is a typical get probability request.

Get probability request, in this get probability request.

[FL].

You see we can there are lots of features, one feature is you see that this is a cite district type demo district, demo district is a feature, name is demo district same thing. And, we can get the district information, we can get the forest information, hospital information and these the these are the features available in this portal.

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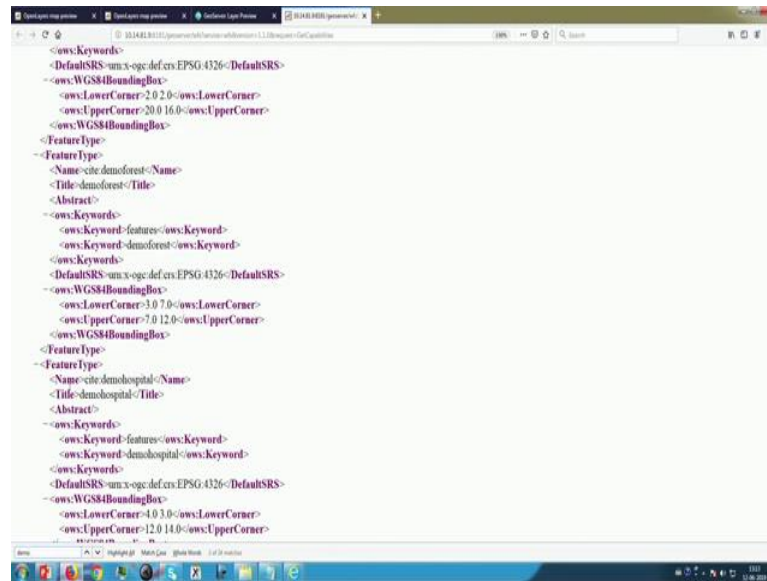
And, we can you can get only the feature type, name of the feature and what is the bounding box of that features.

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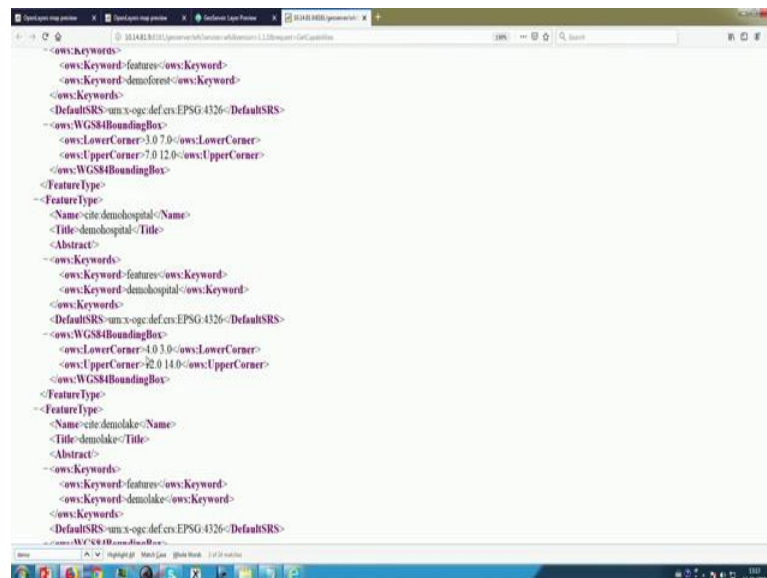
That type of information we can find from get probability service, demo lake these are the features available in this portal. Suppose, I want to know what is the sorry want to know the what is the structure of actual schema of that particular feature, for that we are we need to use the.

Describe feature.

Describe feature service and, that is this is a some OGC standard format in for describe feature service we want to retrieve the school information. What is the schema of school? It will this is the schema of school.
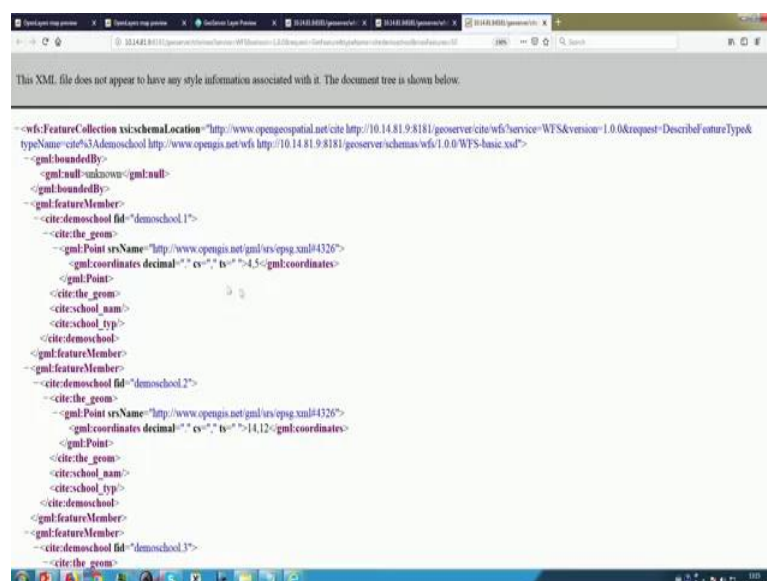
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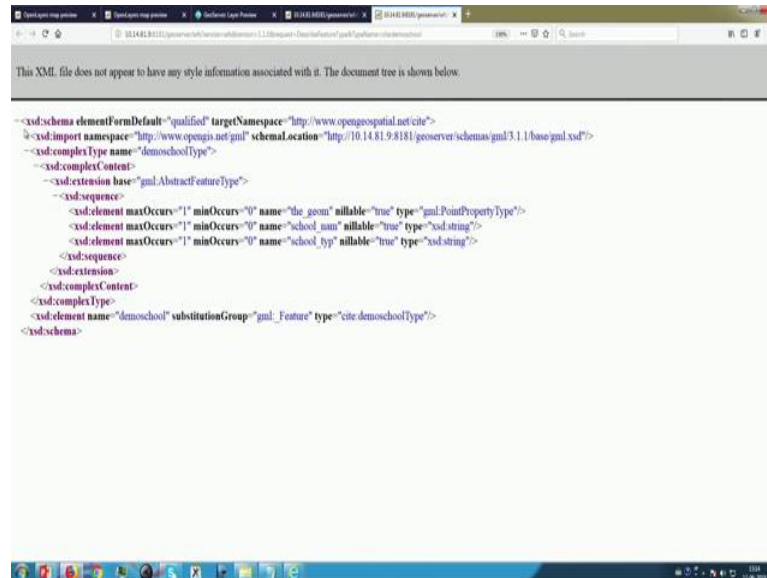
It is provided by our server. Basically this datatype, the school data type this is the school data type data type name is school. And, its members are basically this school name is one member another school type is second member and geometry is the.

This it contains three types of attributes, these are all school type definition. And, suppose I want to retrieve the actual data of school and in during the retrieving the data, it will confirms this XSD and.

Minimize.

For retrieve the actual data of the school we have to use the get feature service or this is also a OGC standard service. It retrieves the actual data of in GML format, this is the GML of school.

We have seen few minutes before and this is the GML of school. It displays the school GML by confirming the XSD, that just XSD of the school.

So, next is the next thing what we want to look at; so, that what he is shown is the WFS: Web Feature Services, that how the feature are extracted and the things. Like starting from the probability, describe feature and other feature services such extracting the data. And, then we have the map service which used for allow access for the spatial feature stored in the web and renders the in the form of a map image map right.

Again, if you recollect that we discussed about this through WMS, following action can be done; producing maps, very simple query on the of the data. It integrates a style sheet as we have seen that the feature sheet along with the style sheet produce the map right. So, I have the data, I the data need to be styled appropriately to display on the map. So, there is the important thing here is a style sheet and then the how map can be displayed. So, this web map service basically deals with that right.

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These are the some standard to retrieve the data in form of map, it is called according to OGC standard it is called GetMap service. Through GetMap service we can retrieve the map of any features.

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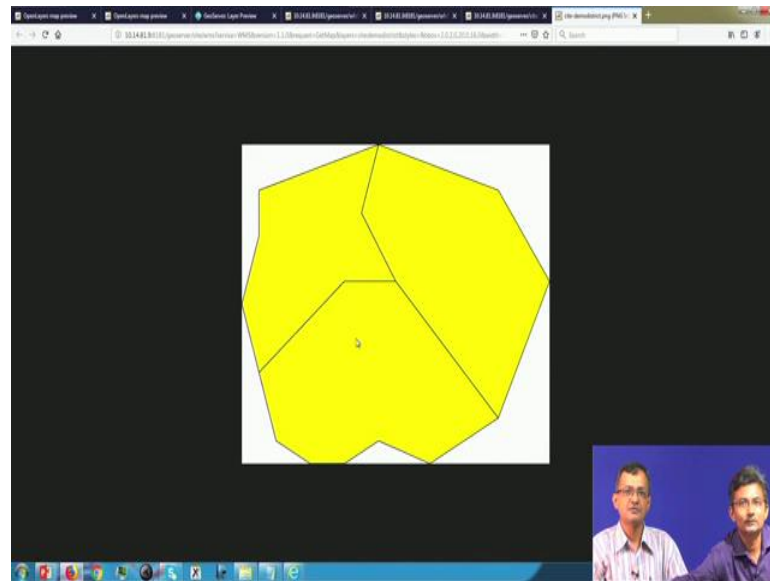
Suppose I am to retrieve the district map then these our district map to retrieve the district map, this is the URL style, this is the standard URL standard URL it these. Through this standard URL we can display or retrieve the any feature of the geo spatial any geo spatial features.

This is the polygonal features, suppose I want to river this is the line features.

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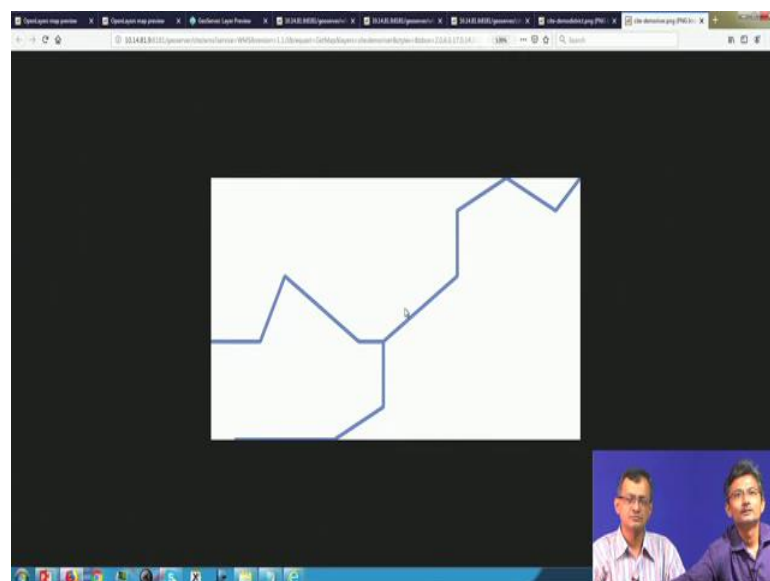
So, these are all we they did a synthetic data for this demo purpose. So, some line feature and then the district was a polygon feature right.

And, another is point feature is the school.

A school.

Is the point feature.

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These are the points of 3 schools: one two are primary and one is high school then I have to show the actual demo on geo GeoServer.
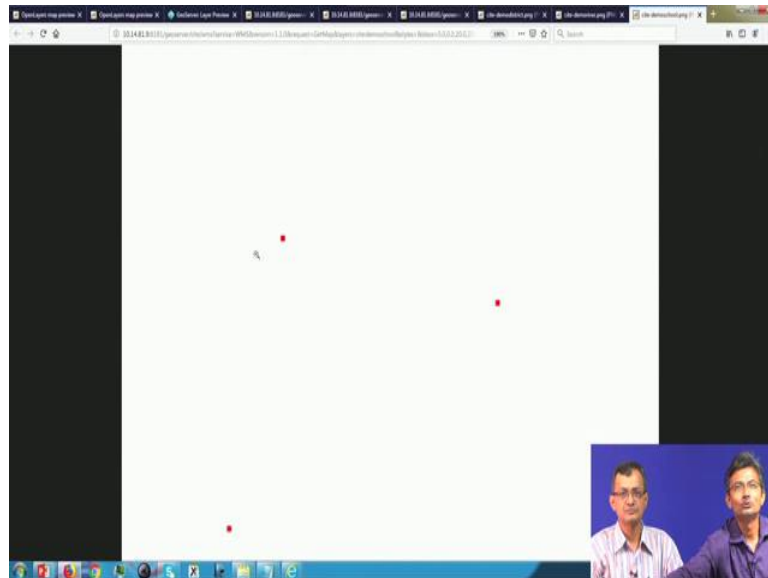
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So, as he has shown so, we have that we can extract the data by this WFS, put style sheet and display the map. Same that district has displays as a polygon and road and this river and your schools.
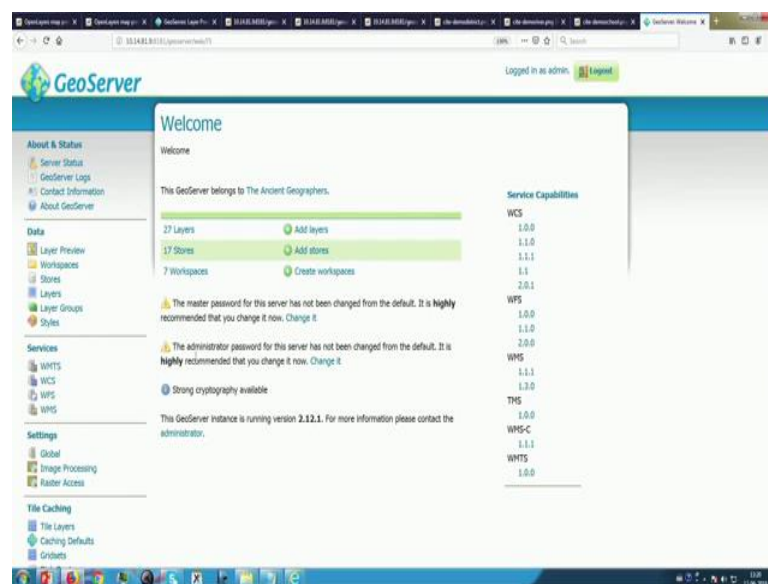
Now, Aridham will show a demo that overall basic using all these OGC services. So, you will be using a open source GeoServer.

Open source GeoServer.

There is a open source GeoServer, you can install in your own system and then you can play with this type of data that exactly what you want to show right.

Yeah.

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GeoServer is an open-source tool we can get the flavour of WFS, WMS service through these GeoServer, we can include data, we can store data in through the GeoServer into the database. And, any spatial data into the database and retrieve the data in form of W map service or feature service. I will show you how to store the data into the data GeoServer and how to.

Retrieve.

Retrieve those data from the GeoServer. There is a username. This is the after at first you have to store any geospatial data, you have to go to store here, then go to add new store.

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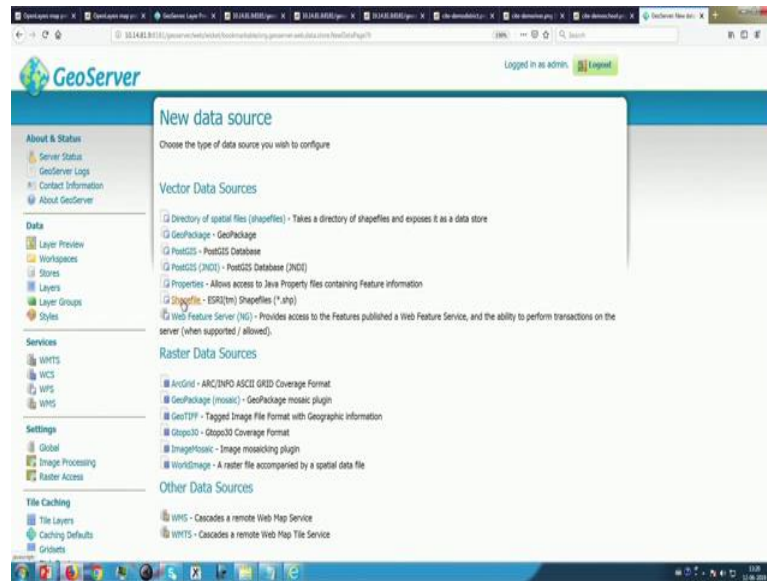
And, if you have Shapefile then go to or any other database then click on any format. If you have Shapefile then you click on here click on Shapefile. If you have data in PostGIS sequel then you have to click here. There are lots of you can use any type of database all are supported by GeoServer.

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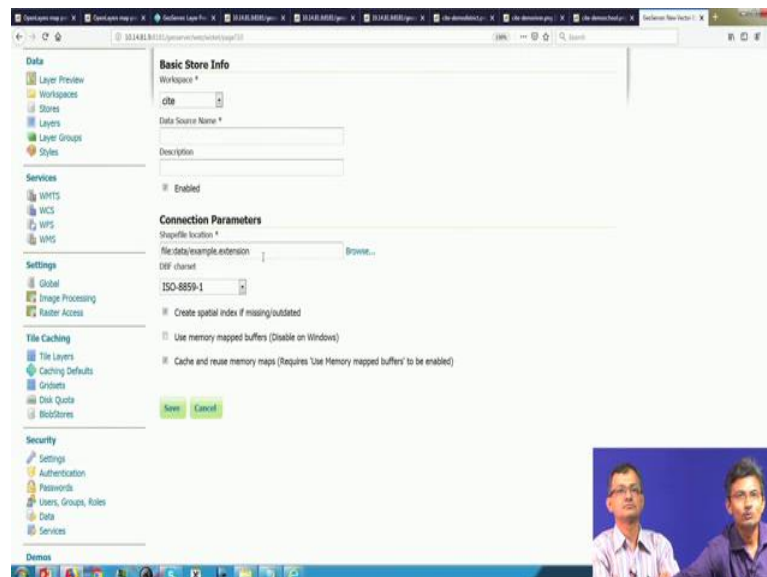
And now, I will show you how to add Shapefile. To add Shapefile suppose in your own machine you have some Shapefile and to retrieve those Shapefile you have to access to from that folder.

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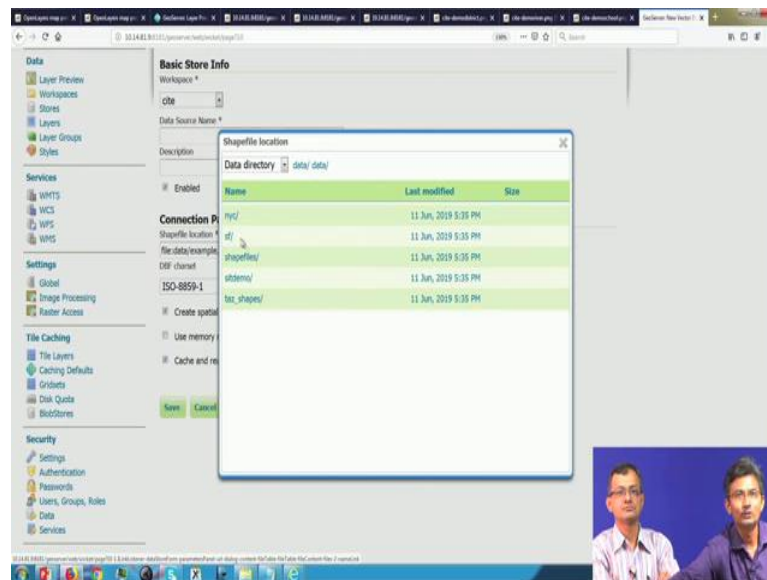
I have some Shapefile here you see district already stored. So, the districts Shapefile suppose and we have to you the shape is a vector format.

Vector format.

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Vector format the data is total is a is a format.

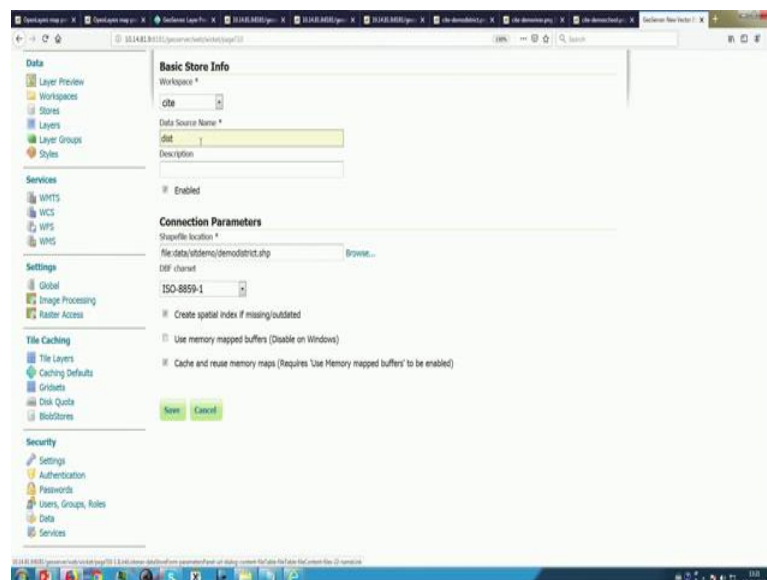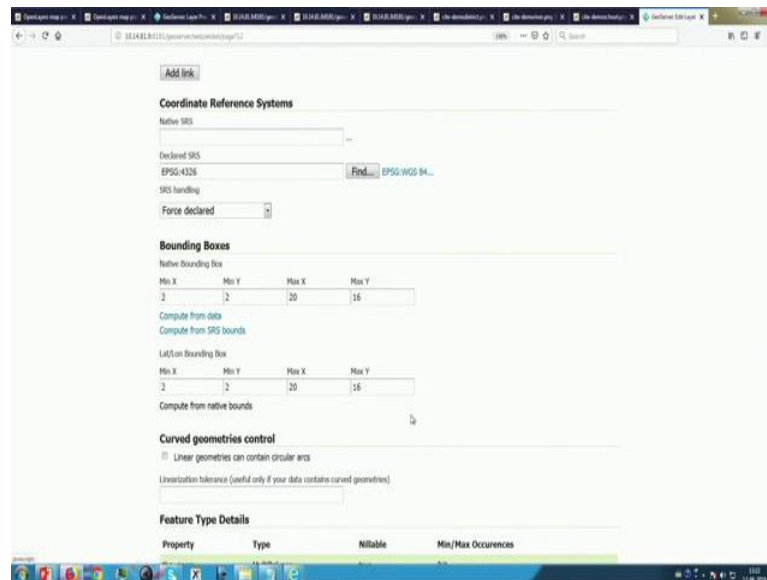This is the suppose district name and then save it, after saving I have to we have to publish this data to the external viewer. For that we have to select to from select the reference system.

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Your reference system our reference system is EPSG 4326.

SG.

Now, after putting the EPSG it will show the bounding box here, now this is the bounding box. This is the latitude longitude in case of same, in this case, now save it. Now, we have to select that style sheet then go to the publishing tab, since it is a polygonal the feature is polygonal. So, I have to choose any style sheet inbuilt style sheet from here. Suppose, I have select this is a green style not green color green means you have to swing little here. Since, it is a polygon you choose the polygon style sheet and now you save it sorry city.

The namespace is cite actually.

This namespace is already exist basically.

Demodistrict ok, it is already it is showing it is already I have loaded that is why it is showing here it.
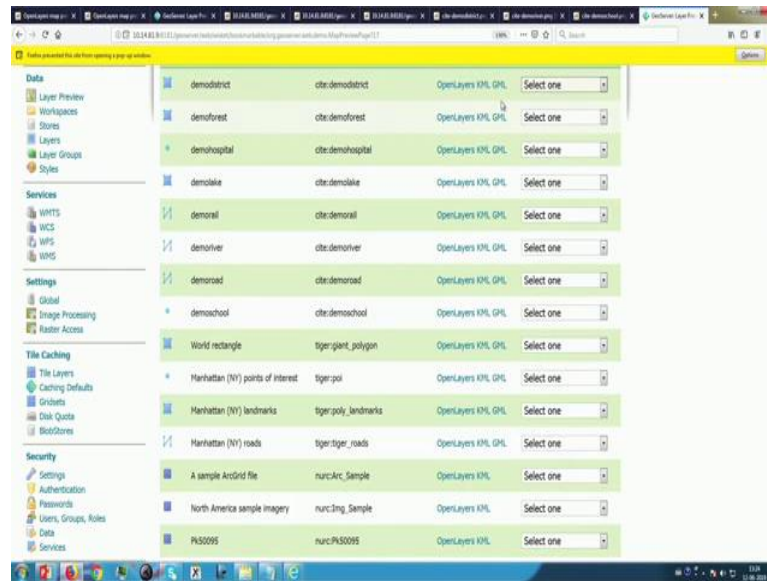
Then after that you have to retrieve the layers from here, just for layer preview you see the layer is already added here. For that we can you retrieve the GML file from here GML 2 version suppose. This is a GML file. Suppose I want to show the map then click here.

Right.
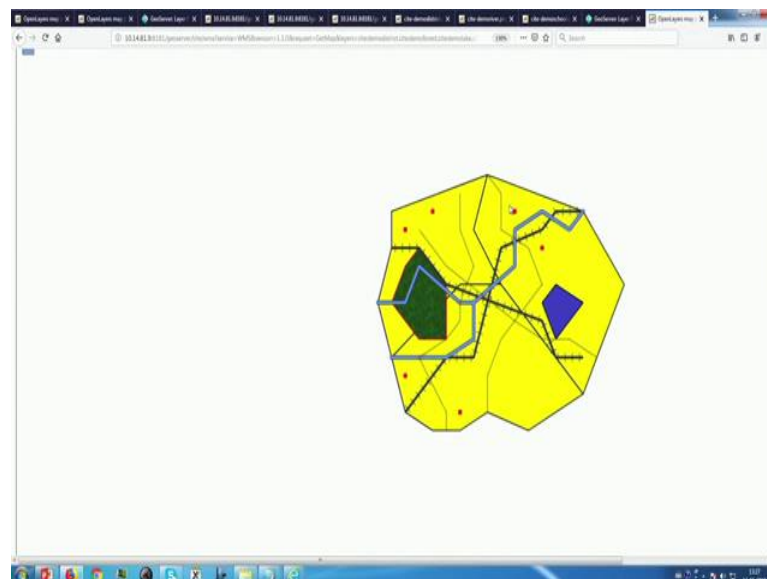
Open layers, it will show the map here, it is it will show also this is basically map service. It will show some information from here if you click on here, you will see the

district name. Yet, this is the NALANDA VALLY district, if you click here this is the HEAVEN VALLY district, if you click here then it is another district INDRAPRASTHA district.

Similarly, you can retrieve any data from here or you can retrieve the data in combined format. Suppose, I want to this is my I want to give the district map as well as.

Right.

School map.

Super impose and.

Super imposing, school map and as well as rail map and road map, for that we have to put the feature name here; only just put the feature name. Just put here the comma and put the actual demo, cite is the namespace.

And, now you can see the entire map in superimposed format; all attributes, all features are showing on the map, you can zoom it.

And, that attribute data are also shown below.

Yes, these suppose I want to know what is the river name here, just click on river.

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And, it will show the this is basically canal HOLY CANAL and the vally name is in INDRAPRASTHA VALLY. Suppose, I want to know what is the forest name, click on the forest it will show the forest name, forest name offers to 1 basically. And, suppose I want to know the what is the road name here, it will show the which is a metaled road.

NH 2.

NH 2, metaled road is NH 2.

This thing.

Fine.

So, what we have seen here that in this particular demo, see there are three type of features we have considered for the demo purpose: point, line, polyline and polygon. And, what Aridam show us that we can extract the feature by WFS call and then render it with some standard SLD's as you if you remember that style sheets and then put it to them.

I can see individually I can see collectively, see this opens up say a lot of things right. Like this all these road, it is a road, water body like river, forest other polygons they can be there are can be different stakeholders right. Like road with national highway authority, your where say road district maybe it is a district boundary etcetera with some other administrative authorities and type of things.

But, when I want to display and take a call here we are not shown queries, we can do query on those things also. When we are to we need to merge even for display we need to merge this multiple layers right on the fly. But, this is from the severity polarity we can take out this WFS make a integrated schema. And, then display the things on the as in some map form which is compatible with the browser.

You can do it with your own application, if you are running you can extract data and display etcetera. The beauty of the thing is that it helps in interoperability right, I can interpret it with multiple data sheet and allowed me to work with the different type of data sheets right. So, this with this particular demo let us conclude our discussion or spatial web services. And, we will in the means next lecture we will see some other aspects. Thank you.

Thank you.