CityGML and Linked Data: Technologies for GeoDesign

Carsten Ronsdorf from Ordnance Survey presents "CityGML and Linked Data: Technologies for GeoDesign" at the 2011 GeoDesign Summit.

http://video.esri.com/watch/897/citygml-and-linked-data-technologies-for-geodesign

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Video Transcription

00:01 Thank you, Nicholas. I'd like to introduce Carsten Rönsdorf from the Ordnance Survey.

00:13 Yeah. Good morning.

00:14 I should mention that I also represent the Open Geospatial Consortium here, which is a standards organization…

00:19 …in the field of geographic information with a very vibrant group working on 3D geoinformation.

00:26 I was glad to actually have a printed copy of this…of this program…

00:29 …because I was reunited with the actual title of my talk which I frankly forgot when I put the slides together.

00:37 So it's actually an integration platform for geodesign.

00:40 But, that shouldn't be a problem for you because the talk itself is actually exactly the same.

00:47 When I thought about geodesign and started to think about this event and what I could put forward…

00:52 …I figured that an integration platform, a data integration platform would be a really good thing to pull together…

01:00 …in order to, yeah, allow better decision making and better…better collaboration.

01:04 And these are the two technologies that I'm going to introduce.

01:08 So I came up with this little marketing thing to say, Think Geodesign, Think CityGML, Think Linked Data.

01:15 So, these are the two technologies, and I would like to start with CityGML.

01:22 The world itself is 3D. So, perhaps, naturally as an integration platform, a 3D environment could be quite a good choice.

01:30 And the example you see here is the city of Berlin in Germany, and they've created an urban information system…

01:36 ...by integrating a lot of information.

01:38 You can see here quite traditional topographic mapping down there, a 3D model...

01:43 ...perhaps not the most visually appealing that you've ever seen...

01:46 ...but really quite powerful in terms of the information content that is hidden behind that.

01:51 So, for instance, if you click on one of the buildings, for instance, the green one on here...

01:56 ...you actually get information about, yeah, the building itself, in this case it's a hotel...

02:01 ...the address, even the architect who designed it, and you get a reference to the cadastre...

02:07 ...so, if you are...if you have the rights to look into this database, you can actually find out about...about property ownership.

02:15 They use this...this particular model to actually run an awful lot of applications.

02:19 Again, so they use this to create a solar cadastre, to calculate the solar potential of roofs throughout the city...

02:27 ...and at the same time they also use it in a kind of a history application to tell you where the Berlin Wall used to divide the city...

02:35 ...until 1989 and to plan the Berlin Marathon and things like that.

02:39 So, they use it as a quite powerful city management tool and it's something...or it's a...it's a model...

02:48 ...it's a data resource, it's a tool that's based on this technology called...called CityGML.

02:54 So, what is CityGML?

02:56 It's a standard device by the Open Geospatial Consortium, and it's two things in one.

03:02 It's an urban information model and an exchange format.

03:05 So, urban information model means it gives you an idea of, well...

03:09 ...what information to put into an urban information system and, more importantly, how to structure it.

03:16 In terms of an exchange format, it allows you, yeah, to exchange information.

03:20 If, for instance, you are an architect and creating a building information model about a particular building...

03:27 ...you will be able to export it in CityGML and then integrate it into a larger CityGML environment.

03:35 CityGML follows quite a...quite a modulized approach.

03:38 So, these vertical strands that you see in there is the, yeah, the information content that's in

there.

03:44 So we have features, we have objects about buildings, street furniture, transportation, water, vegetation, land use…

03:50 …a terrain model underneath that and appearance which basically means textures.

03:57 One of the philosophies when…when CityGML was created was that we…that we said…

04:01 …well, we couldn't create a model that simply contains everything.

04:04 So we basically followed kind of an 80/20 approach and came to a consensus between 'round about 70 different organizations…

04:10 …to say, Yeah, a core, good, really good city model would have these kind of things.

04:16 And then in addition to that, we give you an extension mechanism that allows you to add kind of the remaining 20 percent…

04:24 …that…that you're interested in, and that works in a way that you can simply add new…new features, new attributes…

04:29 …to the existing definitions, or you can create entirely new themes.

04:34 And up to date, perhaps something in the region of a hundred of these additional themes or modules have been created.

04:41 And these range from, yeah, reasonably simple ones that just add a few attributes, for instance, for noise simulation…

04:50 …calculations and simulations, to entire modeling of utility networks and gas, water, and electricity.

04:57 So you can have very, very complex things to extend the model itself.

05:03 Another very important topic is the integration of data through various levels of detail.

05:09 So with a traditional GIS approach, you will have different layers of information, perhaps a different scale…

05:15 …so that you can make visible or not.

05:18 The philosophy behind CityGML is that on a feature, on, say, an individual building, you can actually integrate all this…

05:25 …information into a single model.

05:27 So, for a building you may have a 2D footprint, you may have a block model and then an LOD 2, level of detail 2…

05:37 …some roof structures, perhaps textures coming into it, and more…a more refined architectural model…

05:44 …and then you can even go into the interior of buildings, and you are able to pull this

together.

05:49 Nothing of this is mandatory, so it really follows a pick-and-mix approach.

05:53 So, let's say for an entire state, you may want to create a regional model then an LOD 0…

06:01 …then a block model for the entire city, for the central business district perhaps, a more refined site model…

06:09 …and, yeah, based on projects that you run in your city, you want…you may want to go into the high LOD 3 and 4.

06:18 So, how is CityGML supported?

06:22 I would like to talk about this a little bit from a software support, a vendor support side…

06:27 …and highlight a couple of projects and activities.

06:31 So, at this point in time, they are…my list of software supporting is 'round about 30 or 35 software vendors.

06:39 Just to pick one, Esri, I think there's some support through the Interoperability extension which is, yeah…

06:46 …a really great starting point, but I think there…there's still some…some way to go to make it even easier to use in…

06:54 …in the 3D Analyst environment.

06:57 They are…there are other open source tools available, and this is just a start in this.

07:02 If…if you look at the use and the data that's actually been created in CityGML, we find a rather long list.

07:10 For instance, most of the cities in Germany have a CityGML model or even a good CityGML model.

07:16 For instance, the Berlin model that I showed earlier has 450,000 buildings with roof shapes in it.

07:22 So, quite a considerable data capture and data management effort.

07:28 IGN in France, the French national mapping agency, has just started to commercially produce CityGML…

07:33 …that they offer in CityGML and I believe Sanborn in this country are offering a similar option.

07:41 Quite a big project in Abu Dhabi where a tender was recently announced where 20,000 buildings in LOD 4…

07:48 …so that means internal building structures, are going to be created as a comparison.

07:52 In Berlin, they…they decided to restrict this to four very high profile buildings where you can

actually go into the interior.

08:00 In the Netherlands, people are thinking about creating a national 3D infrastructure and a national profile for CityGML.

08:09 And then with the European INSPIRE Directive, so that is European law that applies in all 25 member states…

08:17 …that will require in a few years' time public sector providers of national…of geographic information…

08:22 …to make all building information available in CityGML.

08:25 That isn't completely through the process, but it looks quite…that we will…that we will get that.

08:32 So, the second point of the topic, linked data.

08:35 This is a little bit more abstract, and I'm going to use an example to illustrate that.

08:42 So, if you have a building and this building is the new Ordnance Survey headquarters…

08:46 …that my office just moved into before Christmas, we'll have a graphic representation…

08:51 …like a 2D building footprint or any of the LODs in CityGML.

08:57 And then there might be a postal delivery point which is connected to the building because we certainly receive…receive mail.

09:04 In more traditional way of geographic information, we organize this in a way that we give both of them an ID…

09:12 …something we call a TOID for the building and a post code for the delivery address…

09:17 …and that's something we can link and that's…that works quite well.

09:23 What link data does is, it's trying to lower the barrier that you can link these kind of things…

09:28 …and all other kind of things together.

09:31 And by using these identifiers that we had before, it introduces the idea of what is called an HTTP URI…

09:38 …so things that look quite similar to web addresses and, yeah, have something that is not ambiguous.

09:46 So by putting data.ordnancesurvey.co.uk/toid in front of it…

09:51 …it's pretty clear where this identifier originates from.

09:55 Then, once you're there, you can, oops, you can basically add a .html to it…

10:03 …and create a website that publicizes some information about it, so that's a human understandable format.

10:09 You can publish it in RDF which is a, yeah, very, very simple grammar that computers can understand…

10:16 …and create an information resource .rdf, and then you can basically…basically link the two together.

10:27 So, these are four simple steps of how…how to link data which are embedded in these linked data…linked data principles.

10:34 And that's exactly what we've done at Ordnance Survey.

10:37 We…we've publicized some of our data, S link data, for instance, this post code information…

10:44 …this has this HTTP identifier.

10:46 We've created an HTML page that has this information and an RDF resource as well.

10:54 So, once you've started to link two things together, you can actually go much, much further…

10:58 …and also link in other resources in terms of landownership and perhaps planning permissions and stuff like that.

11:06 So, the overall idea behind this talk was to say, In order to integrate data, you probably want to have a stable framework…

11:12 …the GIS or GI database and extension.

11:15 That is kind of the space where CityGML plays and then to add supplementary information from authoritative sources…

11:23 …from government agency, or perhaps the entire web, this is what linked data actually gives you.

11:30 Okay. Thanks for inviting me. Thanks for listening.

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