What is the control plane? Presentation given at GLIF meeting 8 Feb. 06

Jeroen van der Ham vdham@science.uva.nl

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Control Plane ooo	Network Descriptions oo	Service Descriptions		
What is the control plane?				
Jeroen van der Ham				
vdham@science.uva.nl				
System and Network Engineering Universiteit van Amsterdam				
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This presentation aims to show my view of the control plane and to explain the positions of the Network Description Language and the Common Service Definitions.

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Before we begin, I would like to ask you to provide feedback and start discussions. During the last 6 months there have been some interesting discussions on the GLIF control-plane mailinglist, but Bill St. Arnaud, Gigi Karmous-Edwards and myself accounted for 75% of the traffic.

1 Control Plane



Definition of the GGF:

- Control connections
- Disseminate connectivity information
- Calculate optimal path

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The definition of the control plane is taken from the GLIF website, which takes after the GGF GHPN working-group. This talk (and the group so far) aims only at the first two points, controlling connections and disseminating information.

We leave the third point to other researchers, with the idea that if we get the first two points right, it will be trivial to apply path calculation algorithms.



Before we take a look at the optical control plane, we should look at the competition. Take the network of slide 4 and view it as a regular Internet network, with two domains, with some switches and routers and two connections between the domains. If the user on the left wants to reach the user on the right, then the view of the network for that user is as shown in slide 5.



The user and application view the network as one big cloud, where they can put data in and it will magically come out at the right side. The cloud is semitransparent, because if the user takes some effort, he can view the details below, but he can not influence them.



However, the current Optical network is far more complex and can not abstract the details for the user. Rather the user has to ring the operator by telephone or email to get a connection configured. There are currently two scenarios for this:

1.1 Optical Connection: Expert User



The user is an expert and is familiar with all the technologies involved in optical networking. The user is also somewhat familiar with the topology and can clearly express that he desires a specific path. In this case, the top path from left to right.

This expert user either instructs his local operator to forward his request, or makes contact with the operator in the other domain himself.

1.2 Optical Connection: Average User



If the user is not familiar with the topology of either of the networks, than he will have to ask the operator to figure out a path from source to destination. This means that the operator will have to do the path discovery himself, contact the other domain and forward the request of the user.

Because the operator mostly has a technical background and is not familiar with the user's research, there is a reasonable chance that there is a miscommunication regarding the desires of the user and the possibilities of the network.

1.3 Automatic Connection Brokering

Control Plane ∘⊙●	Network Descriptions oo	Service Descriptions		
Connection Brokering				
 Brokeri 	ing service in each dor	main:		
Query connectivity				
Request connections				
• Ex	amples: UCLP, DRAC, D	RAGON, etc.		
Require	e information:			
 Network descriptions 				
• Se	rvice descriptions			
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In the recent years, there have been different efforts to try to automate lightpath configurations. But these efforts are all limited to intra-domain. This does not make them less important, but it shows that some work still needs to be done.

One point about these efforts is important: they require information about the topology and about the services they can offer on that network. This information is needed both about the network, but also from the user, when he is requesting a connection. 2 Network Descriptions



This slide shows an excerpt from an NDL file, for more information see the presentation of Andree Toonk or my website.



2.1 Optical Connection: Expert User

If we use an automated solution, using a network description, then that broker has a clear idea of the network topology. An expert user can interrogate this broker, and determine a path that he wants and then request that path. This is the current state of the NDL work.

2.2 Optical Connection: Average User



We want to achieve this scenario. The user can see the network as a big black box, with connections going in and coming out to other domains, which can also be seen as black boxes. This makes path computation more feasible and leaves the details to the planning inside the domain, where the details are known.

This situation is what we are aiming for with the next version of the NDL. Such abstracted descriptions also allow us to create the graphs for the GOLEs (including clickable connections to other graphs).

3 Service Descriptions



- Network Descriptions provide:
 - Paths through network
 - Information about Paths (in future)
- Service Descriptions:
 - Description of connectivity service
 - Agreement between user and provider

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So far we have talked about the topology and how they can be used in automated solutions. The NDL can provide information about the topology (in detail or abstracted) and in the future it will also contain information about the network (bandwidth, framing, etc.)

What is becoming more apparent is that we need to abstract away the details from the end-user. This can be handled through the abstracted network descriptions, but for real end-users, more abstraction is required. This is where the Service Descriptions are required. The provide a high-level description of the service to the user, but also show details to the operator. And they can be seen as the agreement between the user and the provider of the service.

Control Plane Network Descriptions Service Descriptions Service Descriptions

Service Descriptions make optical connections:

- Predictable
- Verifiable
- Repeatable
- End to end



Because the agreement is now clearly stated to both the user and the provider, this makes the service much more reliable.

Control Plane	Network oo	Descriptions Service Descriptions		
Service Description Example				
Service Name	=	TDMBasic		
Version	=	2006.01.10_v1.1beta		
Framing	=	ITU G.707 G.708		
		G.709		
Access mode	=	{ FE_GFP-F, GE_GFP-F,		
		TGE_GFP-F, OC48, OC192 }		
Frame Rate	=	1192		
Frame Loss Rate	<=	1E-10 frames/sec		

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This shows an example of a service description, for more information about the details of the CSDs, see the presentation and paper by Jerry Sobiesky.

Usage Scenarios for CSDs

Broad Provider defines the services available Narrow User uses CSD to characterise service

Service Descrip

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In essence, the CSD can be used in two ways:

Broad : Defining the scope of the services the provider can offer

Narrow : To specify the desired service of the user

Both scopes are important and can use the same terminology. In essence, the broad scope defines a volume in the *N*-dimensional parameter space. The narrow scope then defines a point in that space. If the point falls inside the volume of a provider, it means the provider can satisfy the demands.



- Both CSD and NDL aim to make lightpaths easier
- NDL aims at topology information
- CSD aims at defining transport services
- SDs can use information from NDs

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In this presentation I tried to clarify the position of the Control Plane, the Network Description Language and the Common Service Definitions. I hope you found it useful and welcome your feedback.