



CDN Experiment in the G-Lab Experimental Facility

Future Internet Communication Technologies

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- German Lab (G-Lab)
 - National platform for Future Internet studies
 - BMBF funded joint research project with 32 partners
 - The VIRTURAMA research project represents the site Hannover
 - G-Lab owns a PlanetLab based experimental facility
 - Accessible for G-Lab partners only





- PlanetLab
 - Distributed testbed for network research
 - Software for distributed testbeds

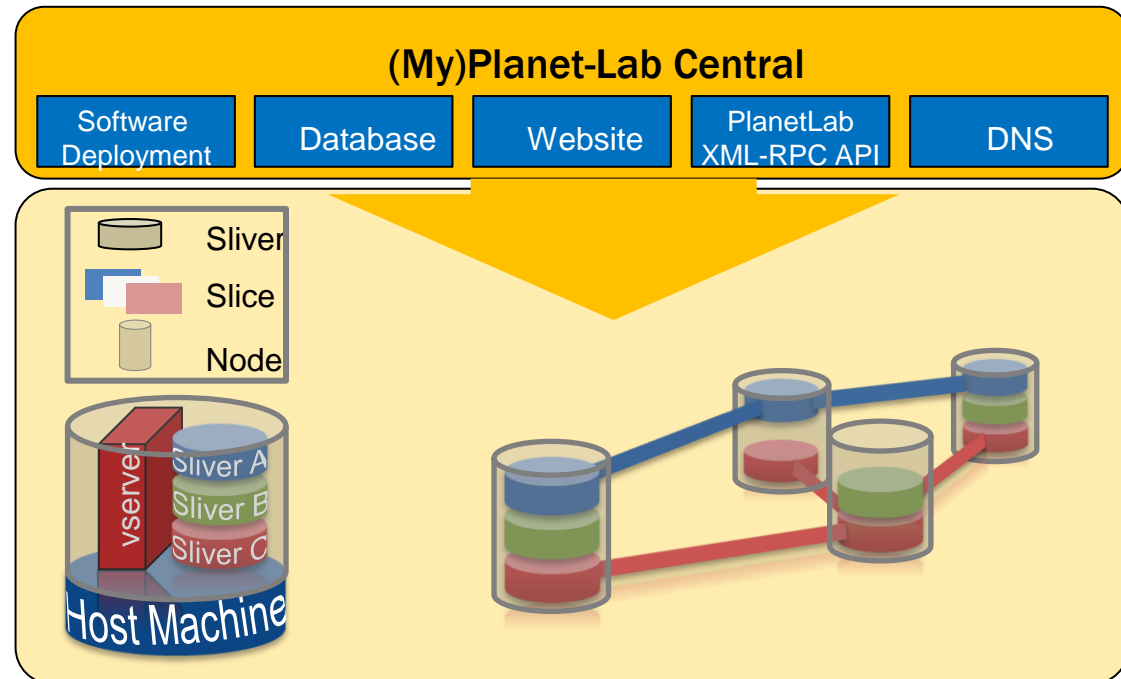


PLANETLAB

An open platform for developing, deploying, and accessing planetary-scale services



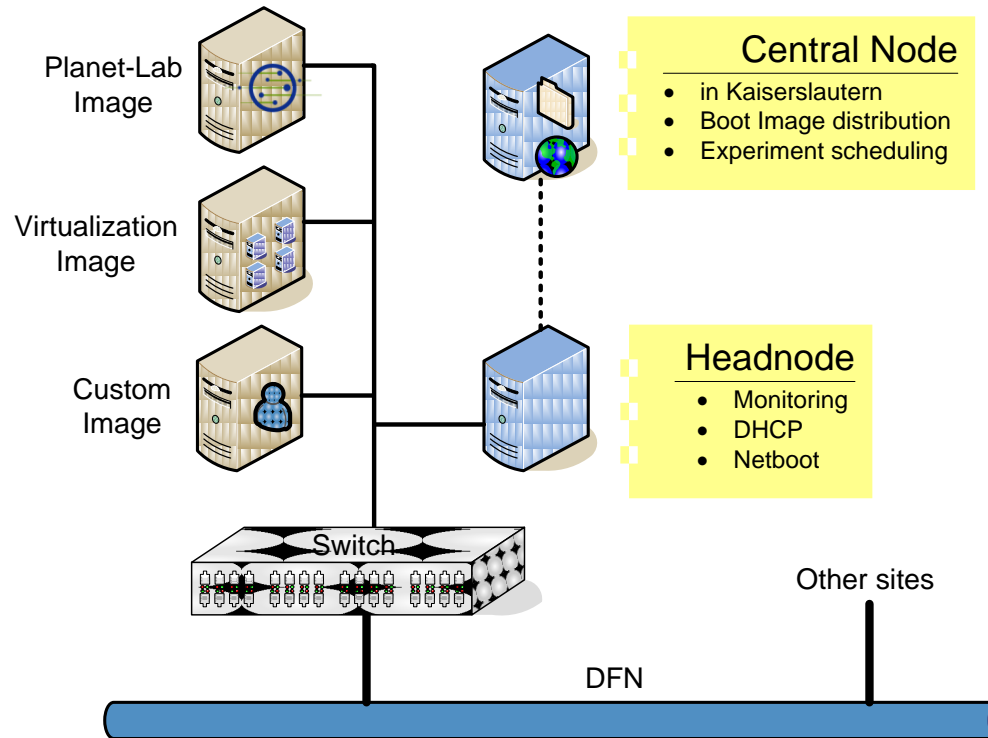
- Several slivers can coexist on a single machine
- A slice consists of multiple slivers
- Central administrative instance
 - Boot image distribution
 - Database system
 - Web interface







- Central node (Kaiserslautern)
- Head node and n experimental nodes at each site
 - Würzburg, Darmstadt, Hannover, ...





- Web interface
 - Site PI creates slice and assigns users to that slice
 - All experimental nodes at any G-Lab site can be chosen
 - User can login to each node and access a virtual machine that is dedicated to the slice
 - Authentication using key pair
 - Public key uploaded to PLC

My slice uha-fi_exp | German-Lab - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

german-lab.de https://master.german-lab.de/db/s

Meistbesuchte Seiten Erste Schritte Aktuelle Nachrichten

My slice uha-fi_exp | Germa...

Nodes

- My Site Nodes
- Register Node

My Slices

- Create Slice
- Sirius

Admin search

- Tags
- Node groups
- Peers

About MyPLC

- PLC API doc
- NMAP doc

Name uha-fi_exp

Description Students experiment of the Future Internet course at UHA

URL http://www.ikt.uni-hannover.de

Expires 18/06/2012

Instantiation plc-instantiated

Site Leibniz Universität Hannover

2 Users

8 Nodes

8 nodes currently in uha-fi_exp

Search and ☒

PEER	HOSTNAME	ARCH	<input type="checkbox"/>
GLab	glab0003.ikt.uni-hannover.de		<input type="checkbox"/>
GLab	glab0002.ikt.uni-hannover.de		<input type="checkbox"/>
GLab	jupiter.planetlab.haw-hamburg.de		<input type="checkbox"/>
GLab	glab176.g-lab.tu-darmstadt.de		<input type="checkbox"/>
GLab	glab0070.14.ikt.german-lab.de		<input type="checkbox"/>
GLab	glab0017.e4.ikt.german-lab.de		<input type="checkbox"/>
GLab	borax-glab.ikt.uni-luebeck.de		<input type="checkbox"/>
GLab	glab0080.14.tum.german-lab.de		<input type="checkbox"/>

167 more nodes available

No tag !!

Renew this slice

Fertig



```
uha_test@glab017:~ 151x20
david@david-desktop:~$ ssh -i ~/.ssh/id_rsa_stud uha_test@glab017.e4.ukl.german-lab.de
Last login: Tue Jun  5 11:13:24 2012 from gateway.ikt.uni-hannover.de
[uha_test@glab017 ~]$
```

SSH Login

Kaiserslautern

*RTT?
TCP
throughput ?*

```
uha_test@glab080:~ 151x20
david@david-desktop:~$ ssh -i ~/.ssh/id_rsa_stud uha_test@glab080.i4.tum.german-lab.de
Last login: Tue Jun  5 11:42:48 2012 from gateway.ikt.uni-hannover.de
[uha_test@glab080 ~]$ iperf -s
```

```
-----
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
-----
```

Iperf (server)

München

RTT/Throughput Measurements (2)



```
uha_test@glab017:~ 151x34
[ 3] 0.0-10.0 sec 27.5 MBytes 23.0 Mbits/sec
[uha_test@glab017 ~]$ ping glab080.i4.tum.german-lab.de -c 10; iperf -c glab080.i4.tum.german-lab.de -i 1 -t 10
PING glab080.i4.tum.german-lab.de (129.187.143.80) 56(84) bytes of data:
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=1 ttl=53 time=14.7 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=2 ttl=53 time=14.4 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=3 ttl=53 time=23.2 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=4 ttl=53 time=23.3 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=5 ttl=53 time=23.2 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=6 ttl=53 time=20.9 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=7 ttl=53 time=14.6 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=8 ttl=53 time=14.6 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=9 ttl=53 time=21.7 ms
64 bytes from glab080.i4.tum.german-lab.de (129.187.143.80): icmp_seq=10 ttl=53 time=15.8 ms

--- glab080.i4.tum.german-lab.de ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9004ms
rtt min/avg/max/mdev = 14.480/18.684/23.301/3.898 ms
-----
Client connecting to glab080.i4.tum.german-lab.de, TCP port 5001
TCP window size: 16.0 KByte (default)
-----
[ 3] local 131.246.112.17 port 41532 connected with 129.187.143.80 port 5001
[ 3] 0.0- 1.0 sec 3.63 MBytes 30.5 Mbits/sec
[ 3] 1.0- 2.0 sec 3.64 MBytes 30.5 Mbits/sec
[ 3] 2.0- 3.0 sec 4.02 MBytes 33.7 Mbits/sec
[ 3] 3.0- 4.0 sec 3.64 MBytes 30.5 Mbits/sec
[ 3] 4.0- 5.0 sec 3.77 MBytes 31.6 Mbits/sec
[ 3] 5.0- 6.0 sec 4.13 MBytes 34.7 Mbits/sec
[ 3] 6.0- 7.0 sec 4.02 MBytes 33.7 Mbits/sec
[ 3] 7.0- 8.0 sec 4.13 MBytes 34.7 Mbits/sec
[ 3] 8.0- 9.0 sec 3.88 MBytes 32.6 Mbits/sec
[ 3] 9.0-10.0 sec 3.68 MBytes 30.9 Mbits/sec
[ 3] 0.0-10.0 sec 38.5 MBytes 32.3 Mbits/sec
[uha_test@glab017 ~]$
```

RTT:
~ 19 ms
TCP
throughput :
~ 32 Mbps

Kaiserslautern

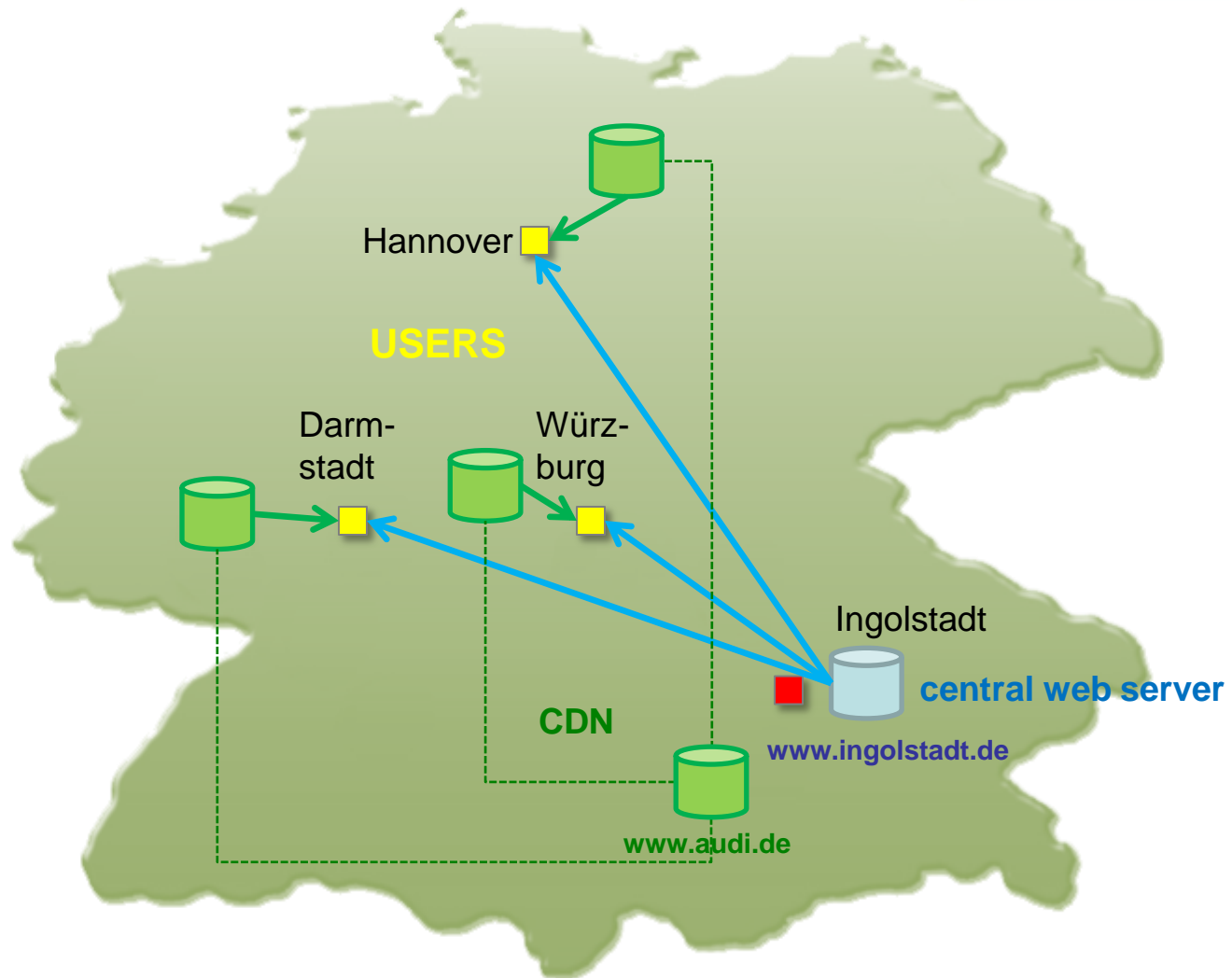
München



- Measure RTT and bandwidth (TCP) between 3 sites

#	Site	Host
1	Hannover	glab005.ikt.uni-hannover.de
2	Darmstadt	glab165.g-lab.tu-darmstadt.de
3	Würzburg	wine065.informatik.uni-wuerzburg.de

	1	2	3
1	-	19.7 ms	8.5 ms
		24.8 Mbps	45.0 Mbps
2	19.7 ms	-	26.1 ms
	22.8 Mbps		19.1 Mbps
3	8.6 ms	26.1 ms	-
	54.4 Mbps	19.1 Mbps	





- Measure the RTT between the user locations and the content servers for the web sites www.ingolstadt.de and www.audi.de

User location	www.ingolstadt.de (hosted by central web server)	www.audi.de (hosted by CDN)
Hannover	IP: 80.86.176.226	IP: 212.201.100.136
	17.9 ms	1.3 ms
Darmstadt	IP: 80.86.176.226	IP: 80.239.230.168
	11.3 ms	1.6 ms
Würzburg	IP: 80.86.176.226	IP: 212.201.100.179
	12.5 ms	1.8 ms

RTT Measurements in a CDN (3)

