GEN6 Roadshow in Berlin:
"Coconut war": IPv6 cloud services in high load scenarios

GOVERNMENTS ENABLED WITH IPv6
GEN6

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This project has received funding from the European Union's

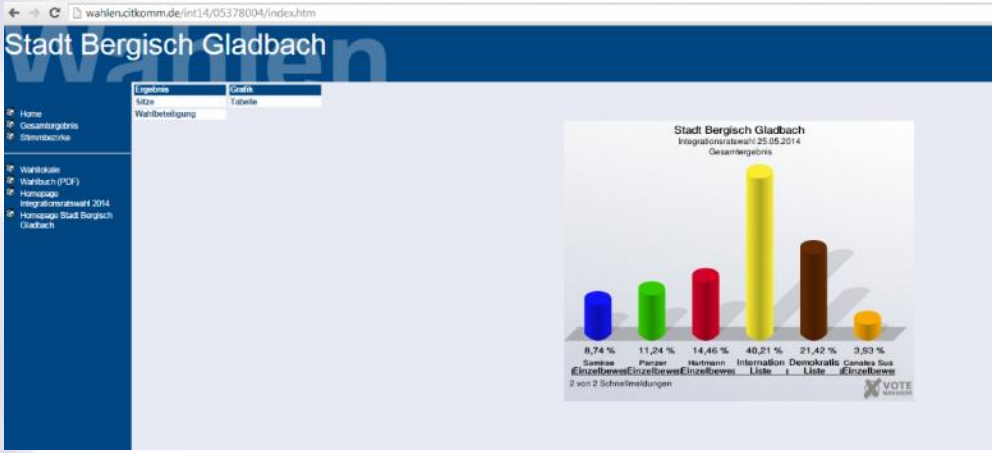
European Commission

The Election Challenge

- Citkomm operates the election count application for the municipalities in South Westphalia
- Results are published in real time via Internet as counting goes on during the election evening
- Elections for local parliaments result in heavy load
- Simulation is difficult for several reasons
  - Number of User
  - Network latency
  - User behaviour in case of delays
- Last local election result presentation five years ago failed substantially
- In May 2014 combined elections Europe and local parliaments

Motivation

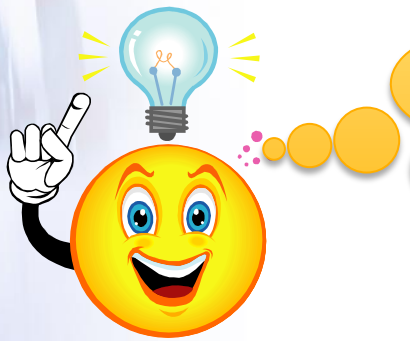
- Citkomm's **VoteManager** service is accessible at wahlen.citkomm.de



- Elections in May 2014
  - Combined European and local parliament elections
  - Heavy load expected
  - Data centre's usual bandwidth for sure insufficient

Solution strategies

- Transition of the whole election infrastructure to an external cloud platform
  - First setup at national elections in autumn 2013 failed
- Extension of the Internet presentation platform to a cloud platform
  - Problems with latencies of frontend result updates due to implementation restrictions in the application services



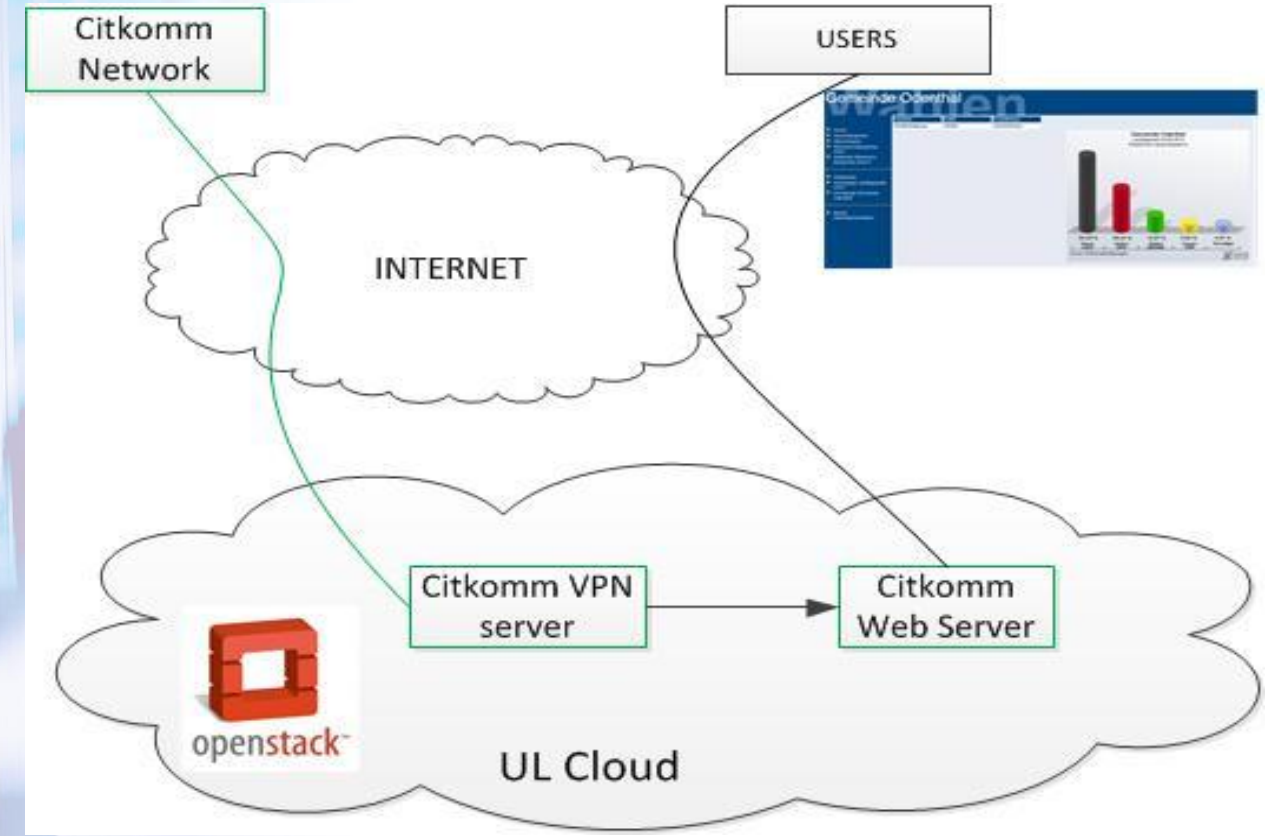
University of Luxembourg investigates IPv6 ability of Open Stack

Idea: combine two parts

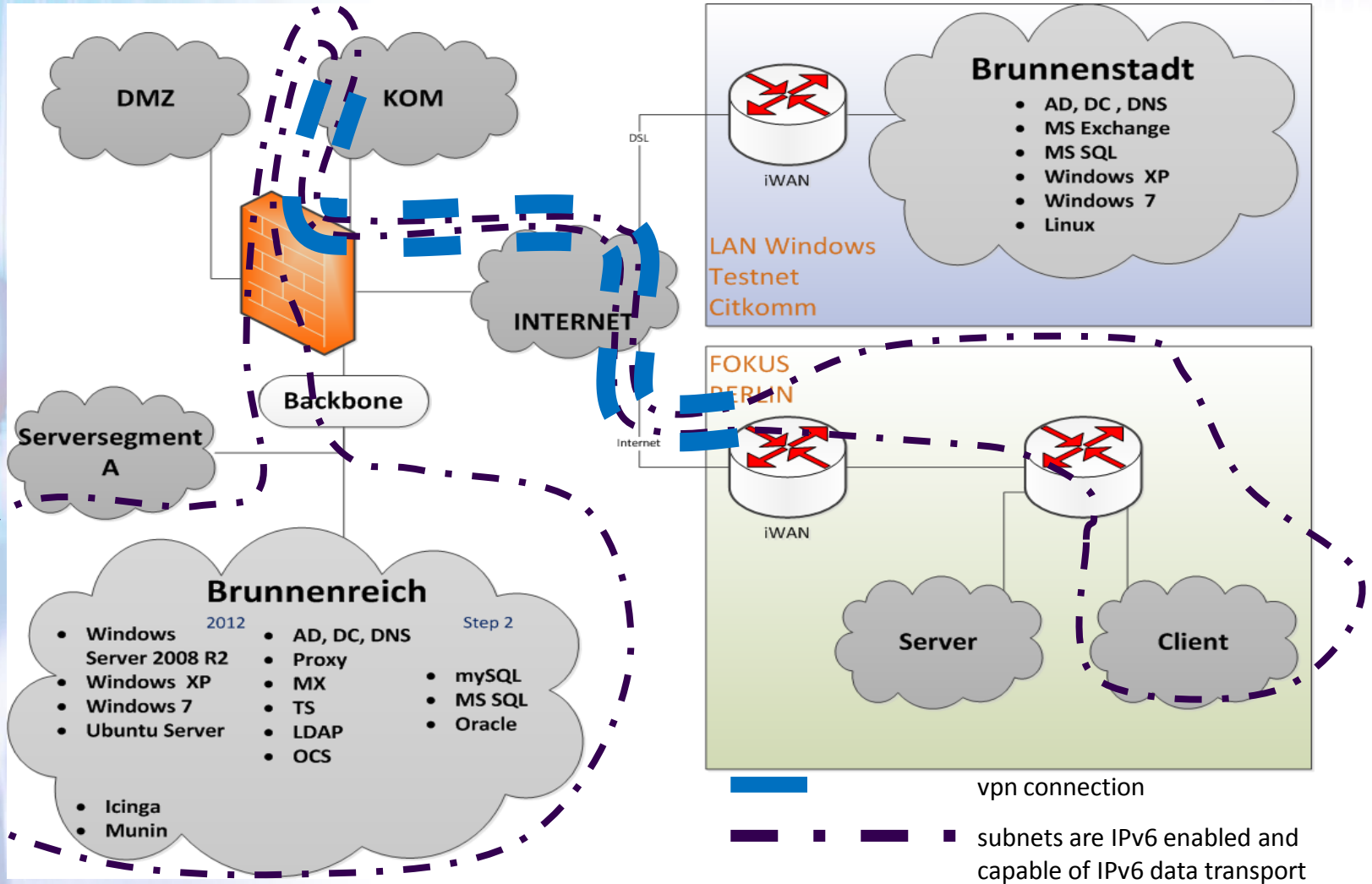
- University of Luxembourg
  - Investigating cloud operating system Open Stack
  - Enabling it for IPv6
  - Security considerations in IPv6 production
  - *Looking for a governmental use case*

- Citkomm
  - Existing election presentation application and structures (backend, frontend)
  - Peak load capable setup for presentation required
  - *Looking for a flexible operation platform*

Integrating the testbed at the University of Luxembourg



Citkomm testbed



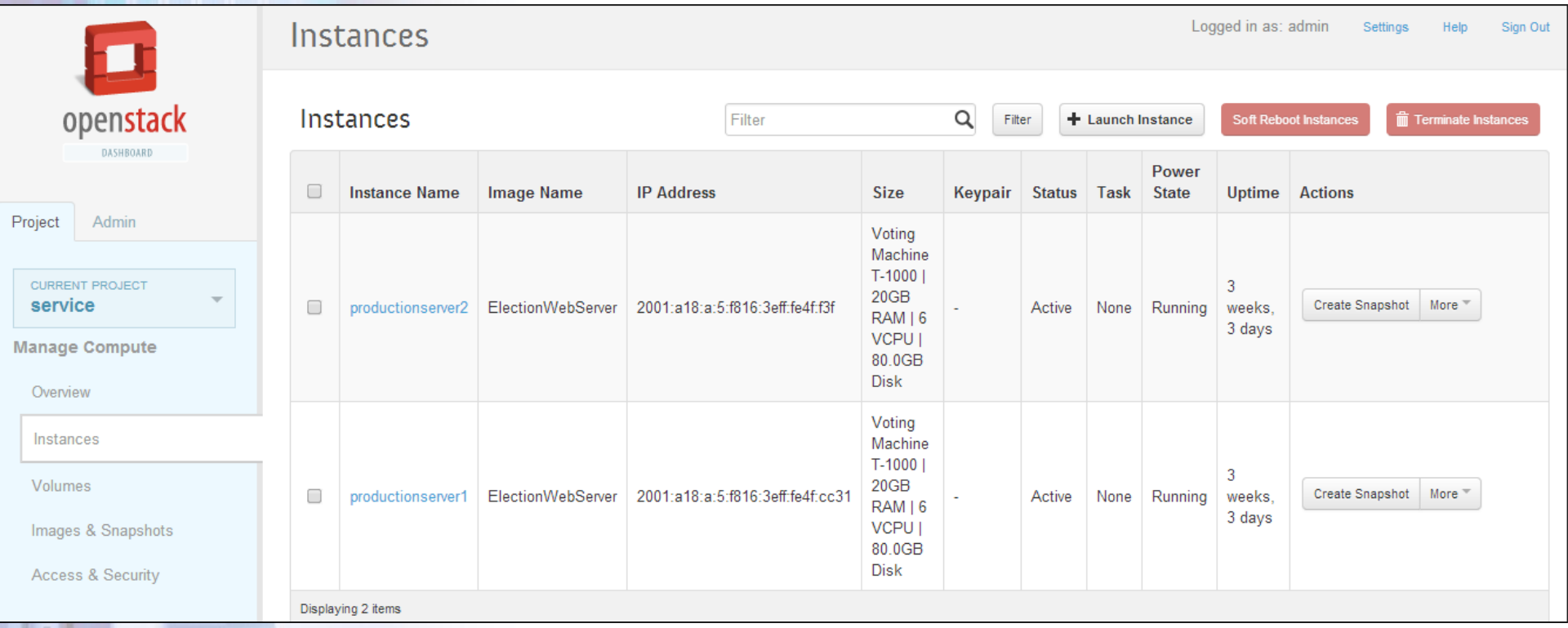
UL testbed: cloud meets IPv6

openstack™
CLOUD SOFTWARE

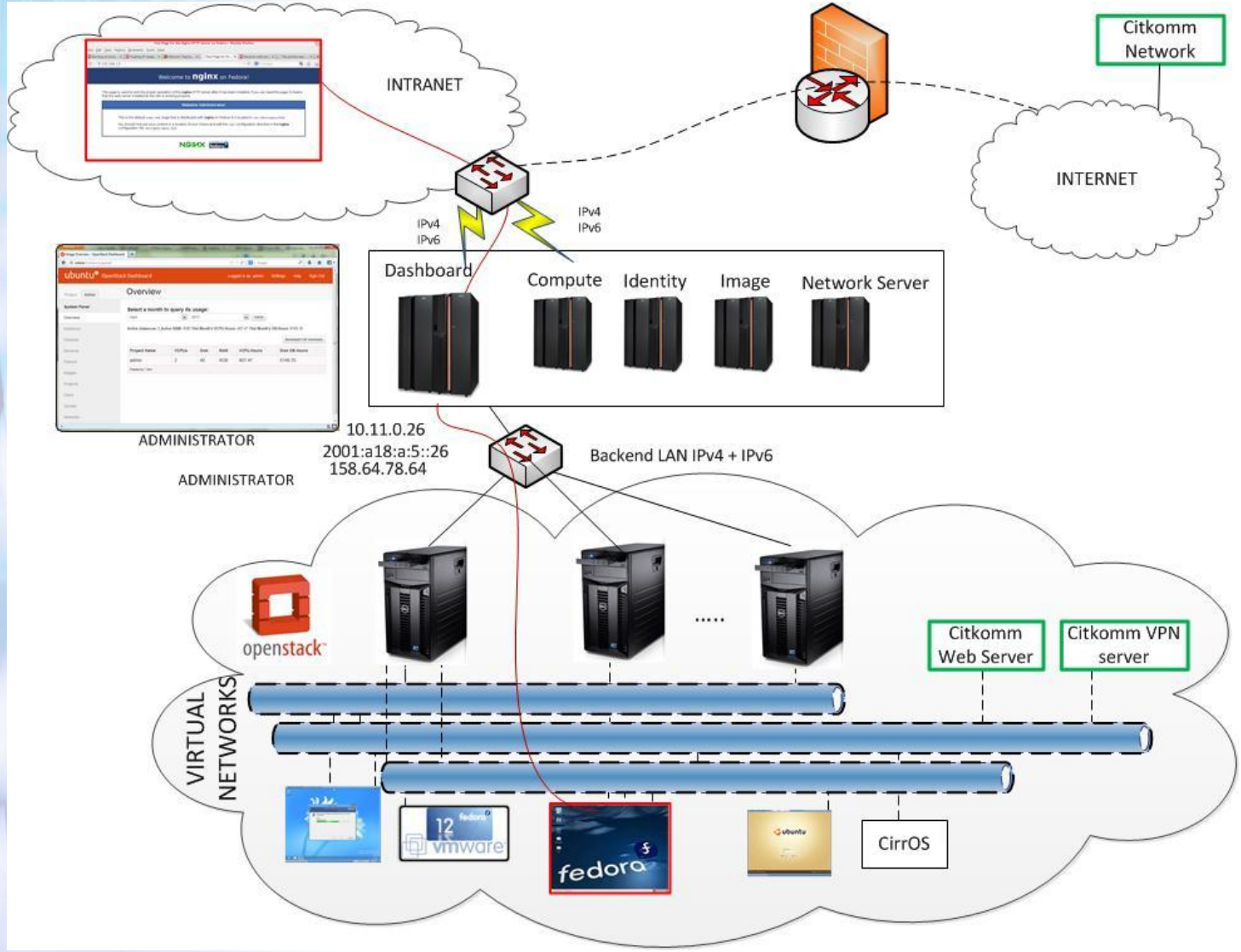
OpenStack = open-source cloud distribution

- More than 200 companies have joined the OpenStack project
  - AT&T, AMD, Canonical, Cisco, Dell, EMC,HP, IBM, Intel, NEC ,Oracle, Red Hat, SUSE Linux, VMware and Yahoo!
- IaaS
- Management of virtual resources (virtual machines)
- VMs in such a cloud distributed across physical machines

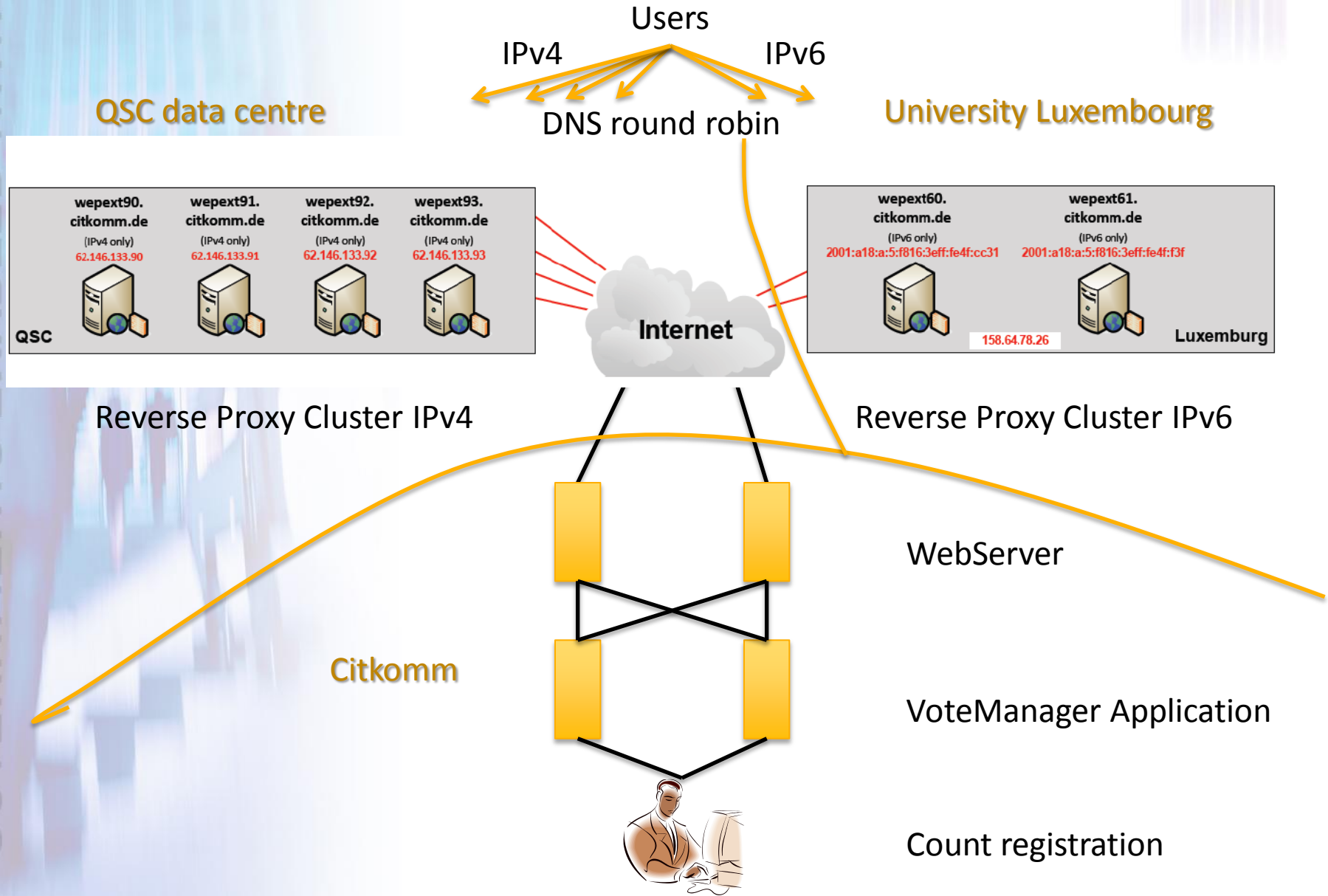
OpenStack administration console



OpenStack Icehouse in an IPv6-enabled network



Resulting Architecture



GEN6

COCONUT WAR

Testing and Monitoring

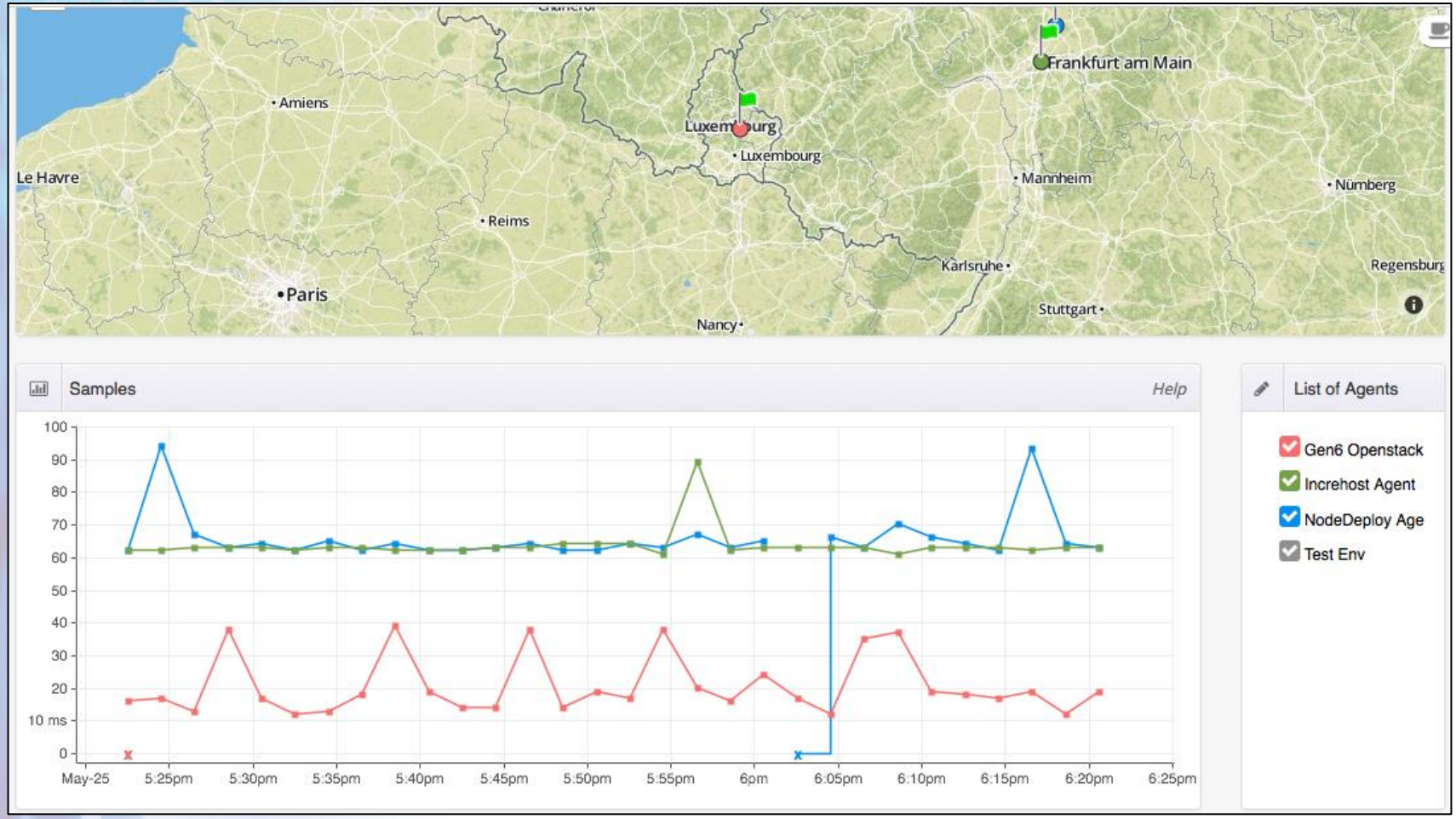
- Challenge:
  - Due to the browser's happy eyeballs strategy IPv6 may never be used if IPv6 responsibility is worse than IPv4's
- Monitoring:
  - Parallel check for IPv4 and IPv6 connectivity
  - distributed agents of v6sonar

  [www.v6sonar.com]

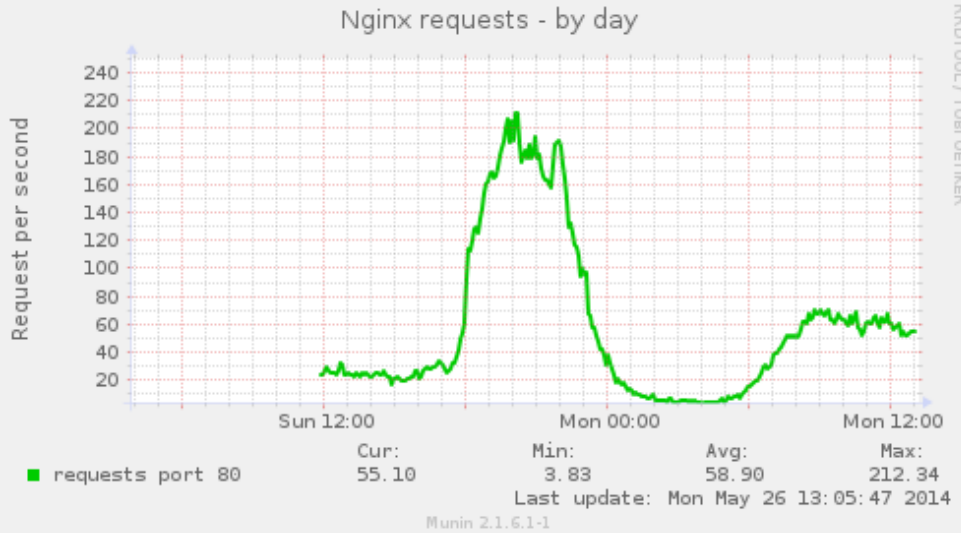
Load Tests

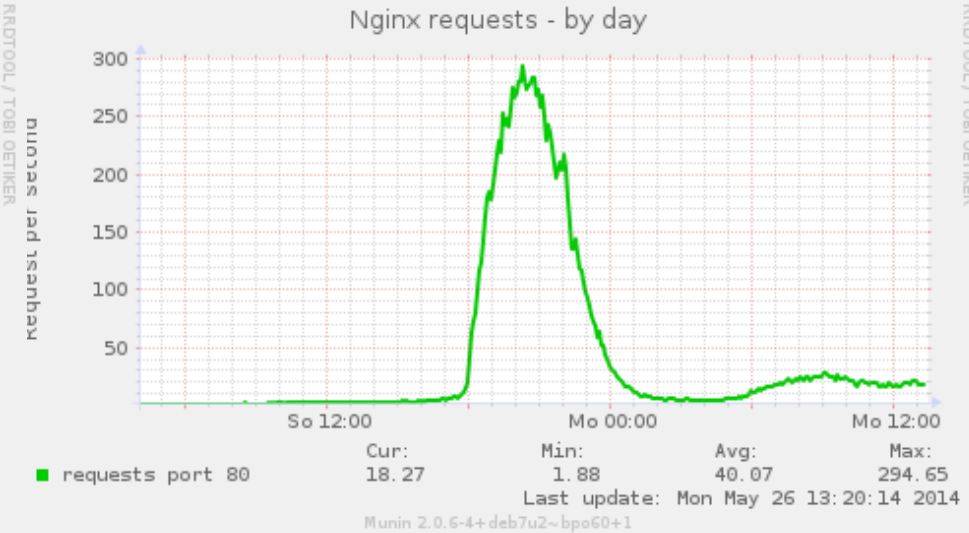
- Heavy load test
  - # connections
  - Bandwidth used
- “Coconut war” in several scenarios
- Using customized services of the distributed platform v6Sonar from Nephos6
- Server stress over 600 Mbps per single server
- Behaviour and limits of IPv6 systems similar to IPv4 servers

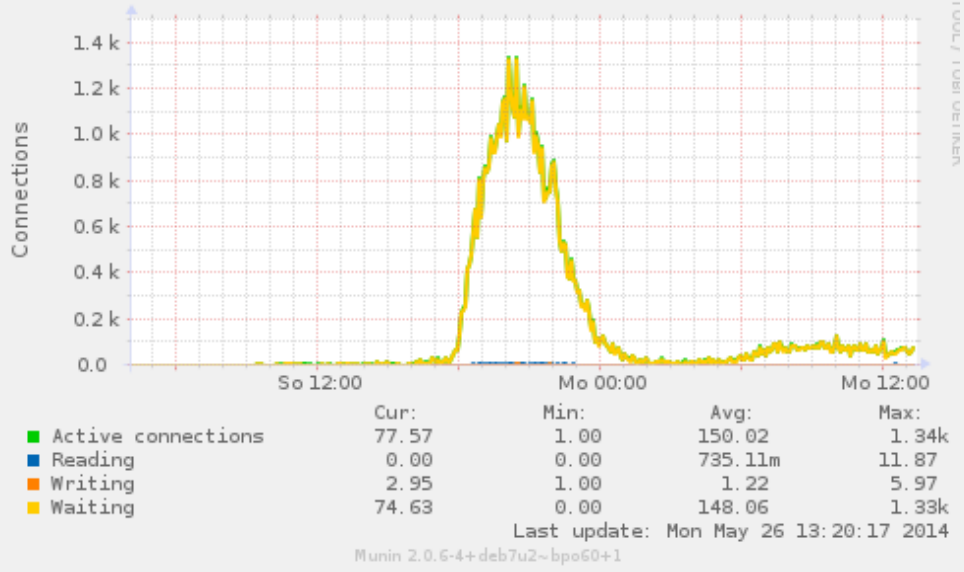
Monitoring of IPv6 user experience

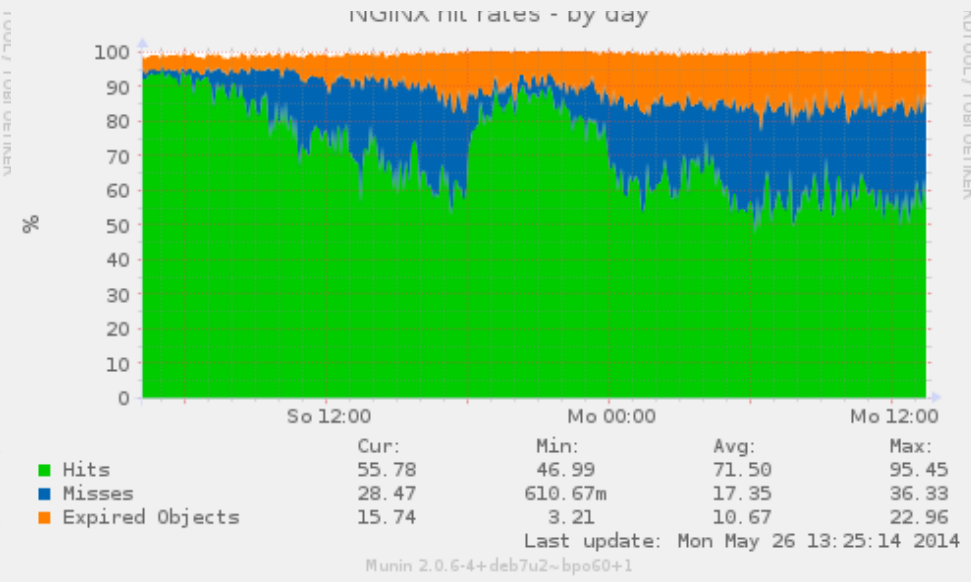


The evening of truth









Summary

- Election presentation could be operated without any problems
- about 5% of the traffic could be served with IPv6
  - Forecast was 2% (due to expected significant share of non IPv6 enabled mobile user)
  - Google average share of IPv6 traffic for Germany was about 9% at that time
- Total load was a fraction of the tested high load scenarios

- *Other data centres still reported shortages and delays in their infrastructure*

Conclusions

The point with IPv6 and cloud

- IPv6 - > addressability and thus end-to-end connectivity
- cloud systems
  - Reduce spending on infrastructure
  - Improve accessibility
  - Enable scaling
- cloud and IPv6 make sense because the resources that IPv6 can access, can be virtualised in the cloud and controlled remotely

What have we learnt?

- IPv6 clouds are the future
- how to deploy an IPv6-enabled private cloud
- how to integrate private cloud to an existing production infrastructure
- first steps towards a resilient infrastructure during regional/national elections

… and at the end

- Some impressions from the election evening
- https://www.youtube.com/watch?v=Mgc4xsvP-9s&list=UUUREB6v-UBZn2XhvM5uunhg&index=2

Questions?

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