Continous Integration & Continous Deployment - For the new nameserver infrastructures of DENIC eG

15/10/03 – Christian Petrasch
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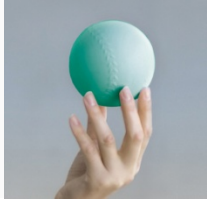
Agenda



1. Motivation
   - Short overview about the old structures
   - Problems with the old deployment technics
   - CI/CD

2. How to reach the goal – Development steps to CI/CD
   - Requirements
   - Developing concepts and the processes

3. Implementation in the new infrastructure and the final processes
   - The new infrastructure
   - The final process
   - Deployment strategy - check

4. Automated tests

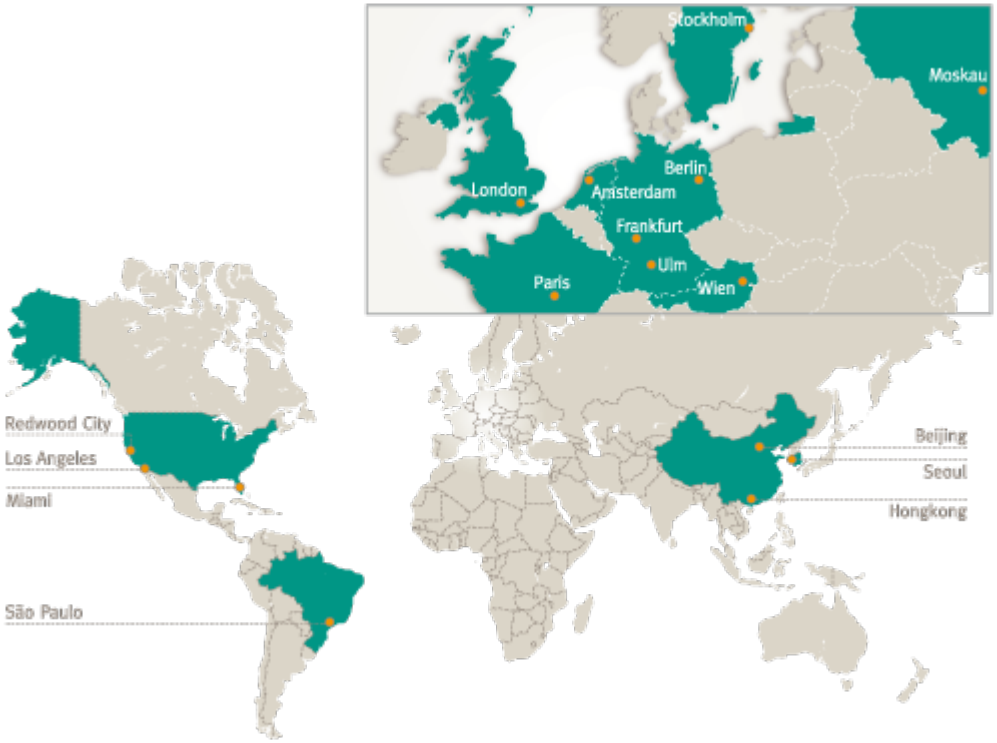
5. Further benefits / Future plans

6. Questions

Motivation

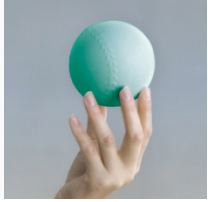
Short overview about the old structures

- DE, enum and several customer TLDs
- 18 locations
- Nearly 300 servers for DNS



- Configuration via CFengine2
- Nameserver software rollout via CFengine2
- Virtualization via images and XEN (not XenServer)
- Monitoring via Nagios

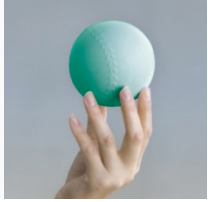
Motivation



Problems with the old deployment technics

- Server images are hard to maintain and keep up to date
- CFengine2 is oversized / Migration from CF2 to CF3 complicated
- A lot of manual, decentral configuration (storage, monitoring, server rollout)
- No centralized administration
- Routing control (slow and unreliable)

Motivation



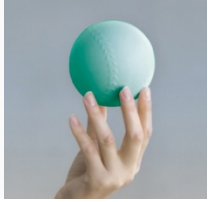
Consilidated....

- Every change takes a lot of time -
  For a new customer we needed several weeks – AAAAAAAAARGGGGGHHH!!!!!!
- Old processes with this amount of servers
  not very handy –
- Configuration failures were nearly unavoidable
- Images prevent nearly all kind of server updates
  because of too much downtimes

© Disney/Pixar

And we change our hardware.....WE NEED STH. NEW !!!!!

Motivation

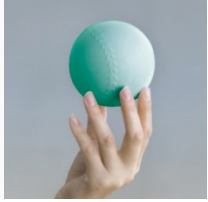


What to do ?

Maybe Continous integration !!

Colleagues from other team already do this …!

Motivation



- Software defined datacenter ?
- Virtualization ?
- Immutable servers ?
- Hmmmm ?

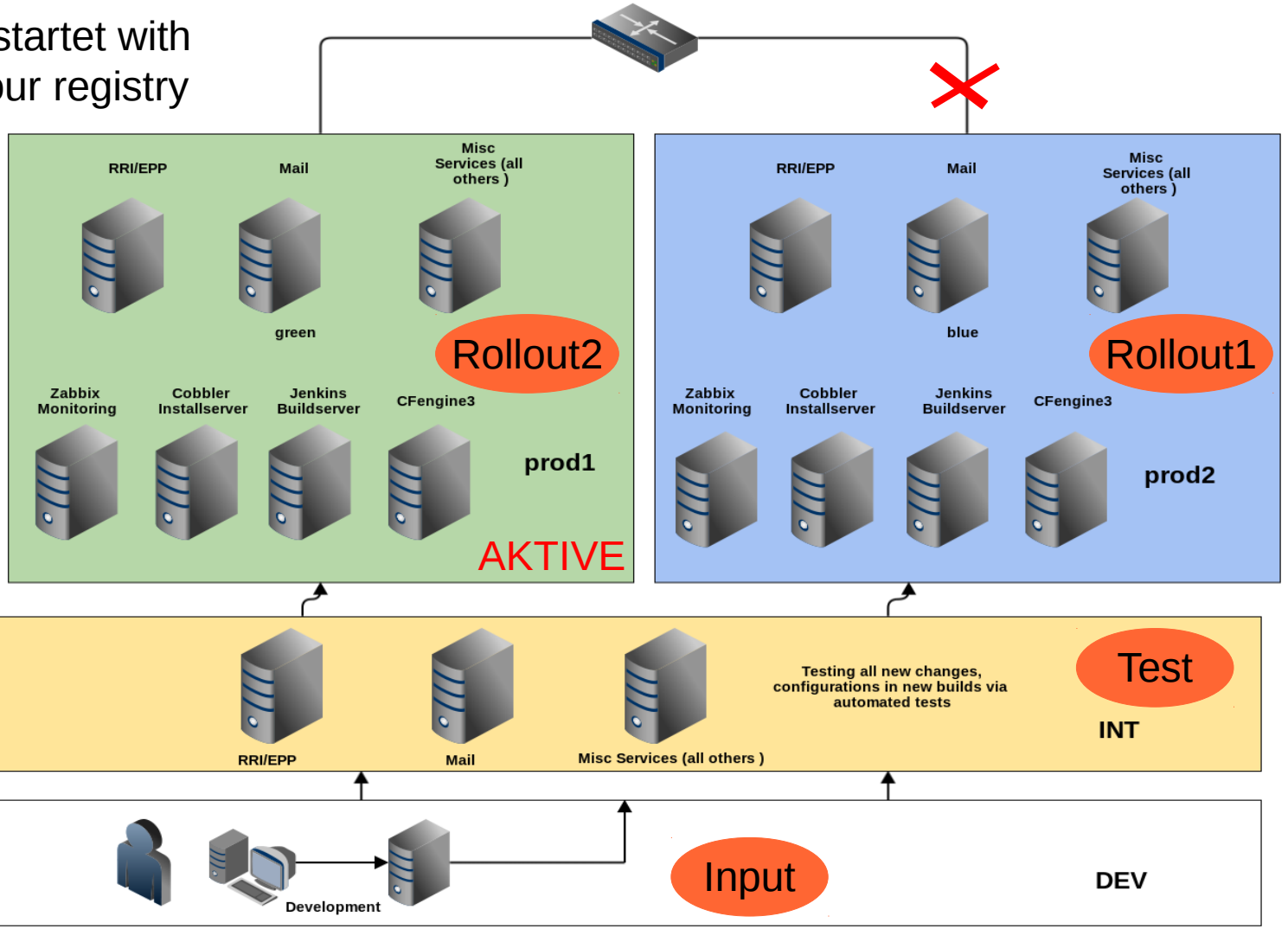
But in reality for DENIC...

- Infrastructure as Code
- Automated tests
- Possibility to change sth. without service outages
- Staging infrastructure
- Possibillity to integrate updates and changes continously

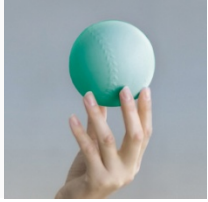
Motivation

At 2012 we startet with CI/CD with our registry

Production switch after rollout !



Motivation ?



After we got a lot of experiences with the registry datacenter CI/CD infrastructure we knew, that CI/CD technics give us a lot advantages...

- Less outages
- Increased agility with changes and updates
- Improved scaling of hardware ressources
- Do better and automated testing

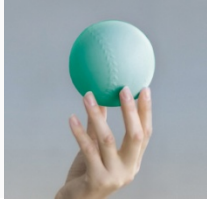
Good … so do this for DNS infrastructure and solve the old problems and obstacles !!

Motivation

Technics have great benefits for DNS infrastructure:

- Reinstallation of a single location fully automated
- Big security increase because of immutable servers, after rebuild possible malware etc. removed
- Automated deployment and testing, parallel installations of all locations should be possible
- Centralized administration platform
- Implement new server only in database and installation fully automated
- Improved control of nameservers and routing via GUI
- Improved testing
- Improved automation at monitoring

For our customers this would be also a great benefit !!
We could react very much faster and implement updates and customers on time !!



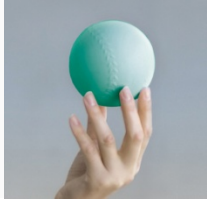
Developing concepts

Questions

- Same tools as registry platform ?
- Which virtualization ?
- How to do configuration management ?
- Which software to control everything ?
- What is needed to connect everything ?

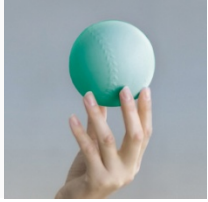
What to do

- Consolidate requirements
- Evaluate and test several hypervisors
- Decide how to want to do configuration management
- Evaluate and test orchestration solutions
- Develop a toolstack



Requirements (the most important)

- Highly reliable and stable
- High cost efficency
- Central administration
- Easy to use, update, test and automate
- Highly automated
- minimized unavoidable downtimes
  and guarantee of no service outage during reinstallation



The hypervisor decision

- Tested VMware, XENserver, KVM
- Tested for Performance, Cost efficiency, Security

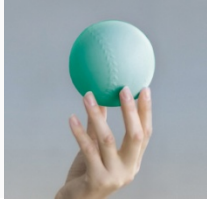
DECISION:

XENserver (free license)

XenServer®
Open Source Virtualization

Reasons:

- Performance good enough
- Security better than KVM
- Free, VMWare too expensive



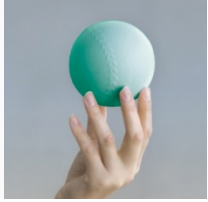
Configuration management

Reasons:

- Has a good Python API
- We need cobbler as installserver, why not as configuration tool
- Cobbler can do configuration templating during installation
- No need for Cfengine etc.

DECISION:

Do it with Cobbler..



The orchestration

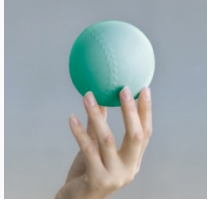
- Centralized
- User interface
- Easy to implement, maintain and expand

DECISION:

Do it with Ansible and Jenkins

Reasons:

- Ansible is written in Python, many plugins
- Easy to learn
- Usable for nearly every hardware
- Jenkins is a good GUI with a lot of Plugins



How to connect all tools to a complete toolstack

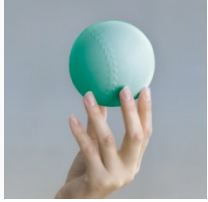
- Common API
- Maybe plugins, modules, etc. available

DECISION:

Do it with Postgres, Python, netconf

Reasons:

- Tools are all in Python (API) (Python)
- Inhouse experiences (PostgresSQL)
- Netconf: Easy to implement as python module in ansible

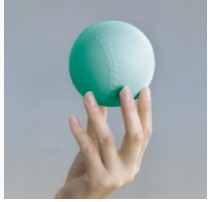


Deployment Strategy

- Two possibilities
  - Switch between BLUE and GREEN infrastructure (like registry)
    - Advantage: Building of servers not in environment with current production
  - Serial deployment server by server
    - Advantage: Service could be provided continously without double the hardware costs.

DECISION:

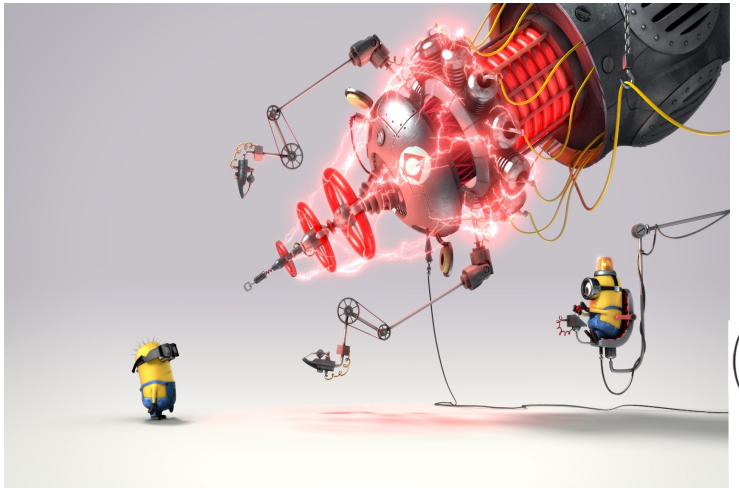
Do it serial, supposing service could be provided with no outage with one nameserver during reinstall. Furthermore double number of hardware in location was not really an option



The final processes

Processes

- Installation (and reconfiguration) of servers
- Implemented automated testing
- Administration of the deployment strategy
- Administration of the infrastructure via Jenkins and Ansible
- Routing administration of all anycast clouds
- Central monitoring and logging



Implementation in the infrastructure and the final processes

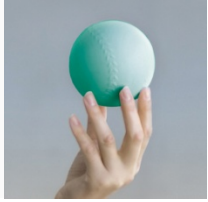
DENIC developed parts of the toolstack:

Nslconfig (Python)
- Edit and read configuration items in database:
- profiles, locations, customers, systems etc.

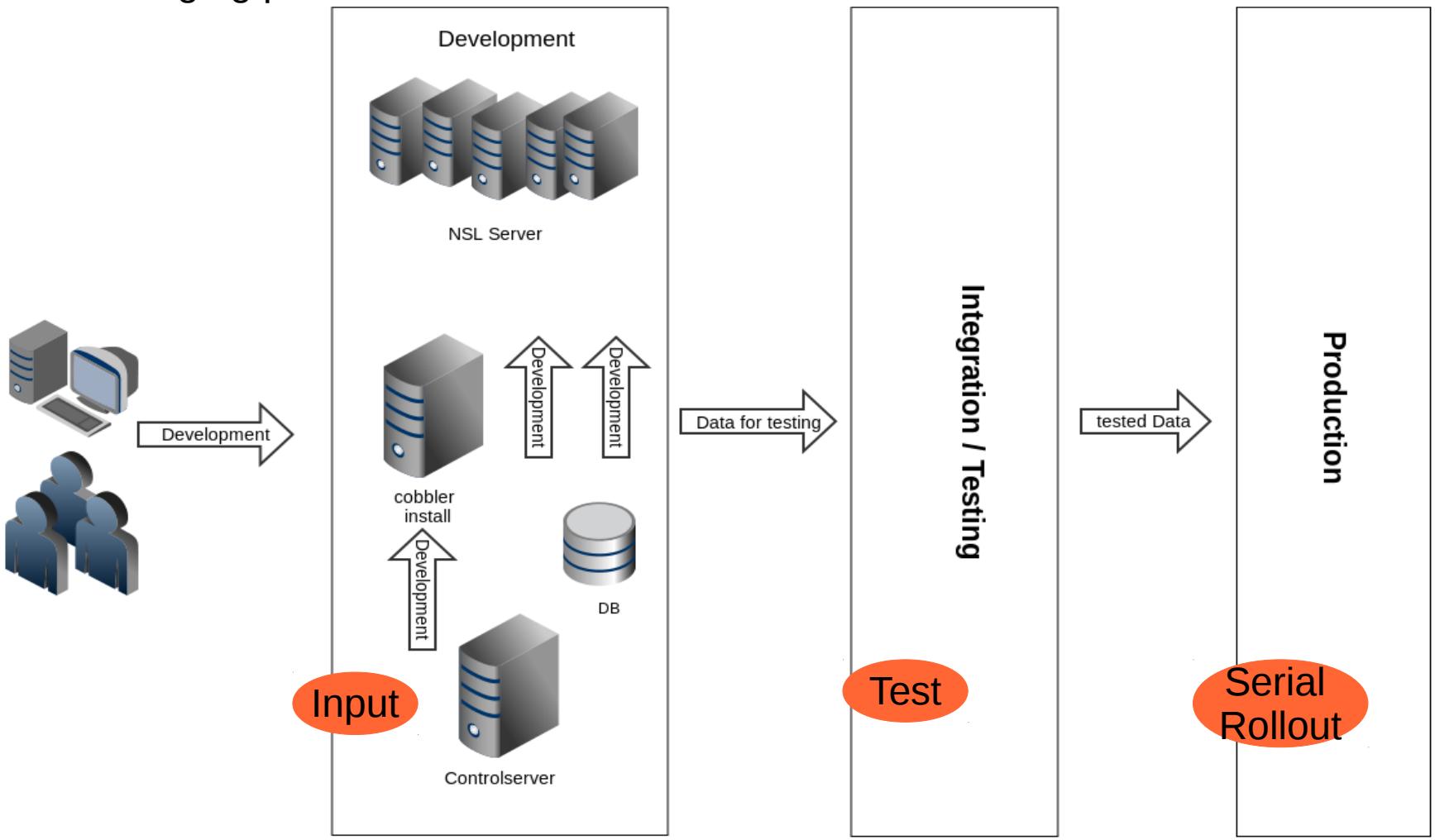
Cobbler_control (Python)
- Communicates with cobbler api and do all jobs which are necessary

PostgreSQL
- Database for all information, which is necessary to build and configure servers.

Ansible
- Ansible is the logic for all purposes behind jenkins

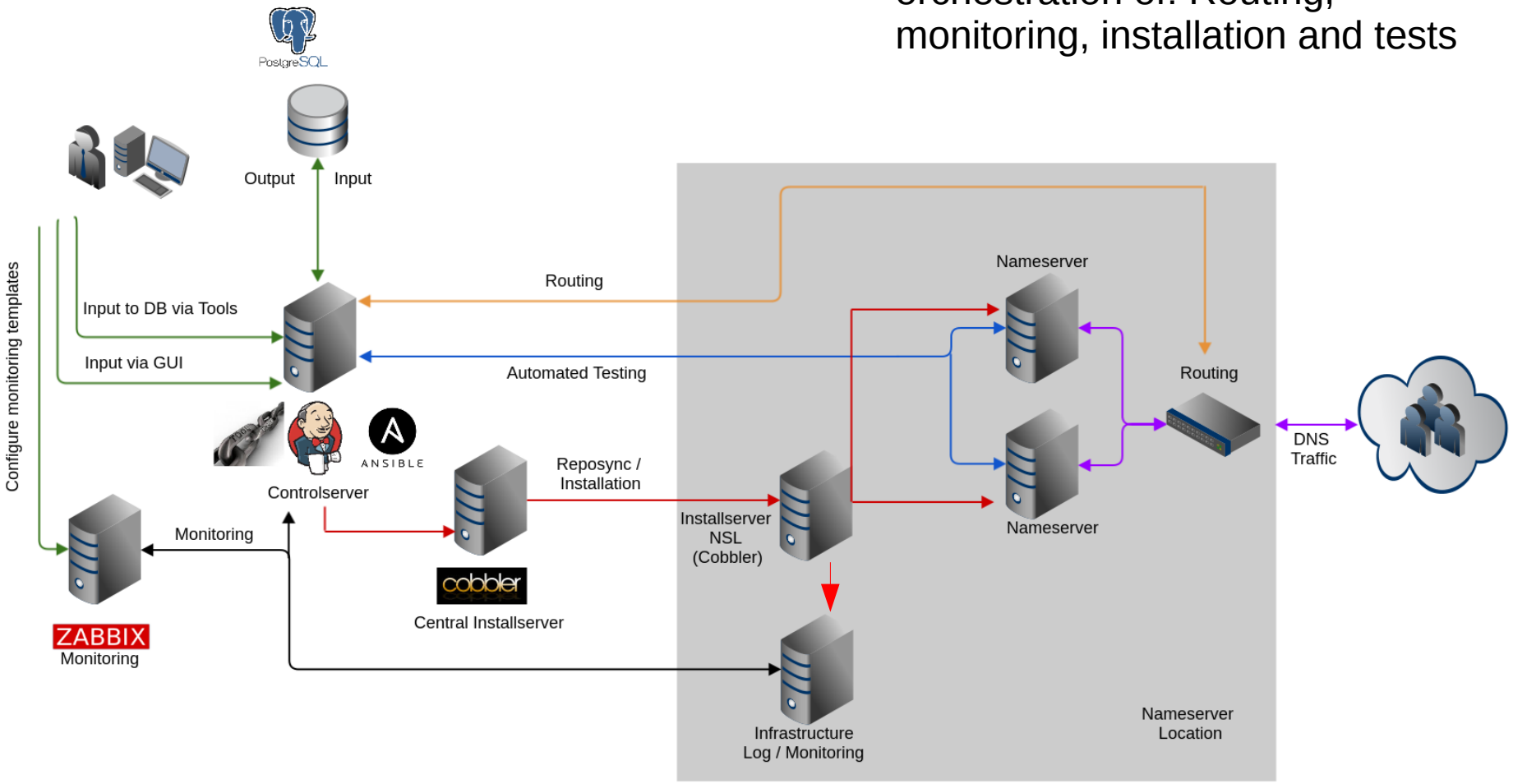


The new staging process



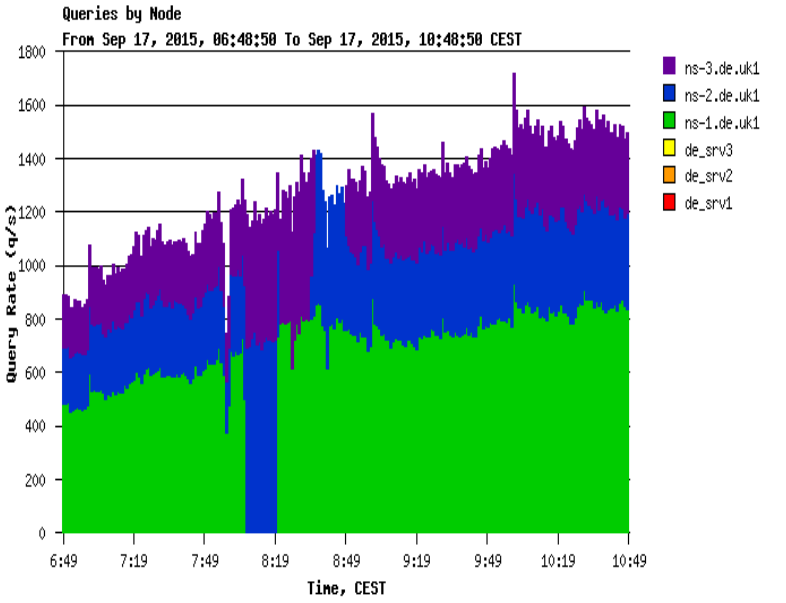
The final process and the deployment strategy

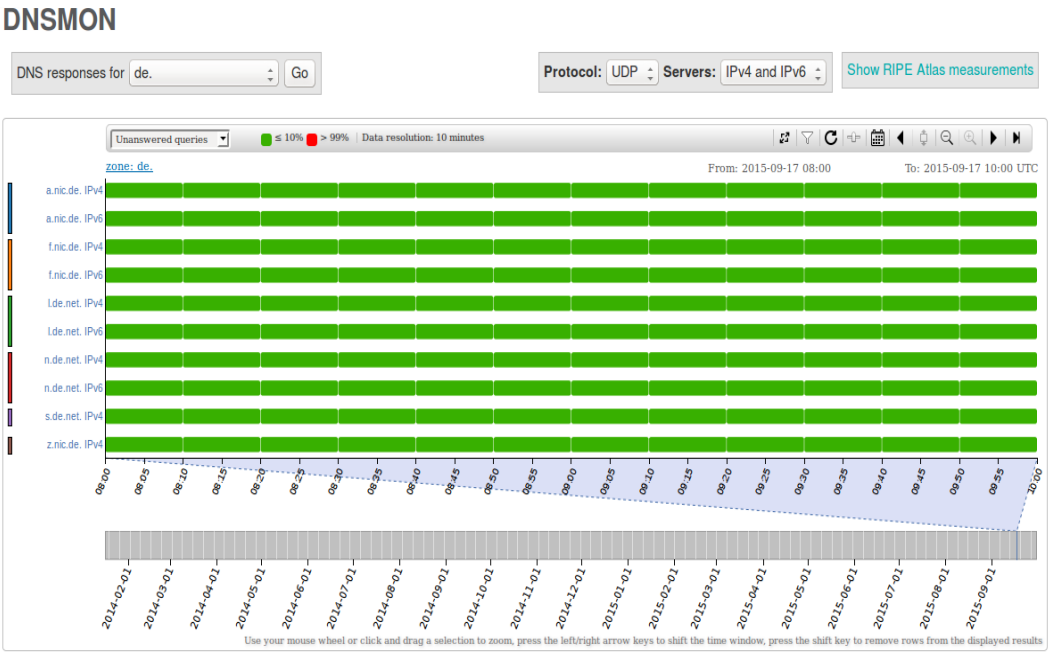
Controlserver controls orchestration of: Routing, monitoring, installation and tests



Deployment Strategy

- Decision with serial deployment was a good decision
  (Rebuild NSL UK1 15/09/17 – 8:05 am – 8:49 am)



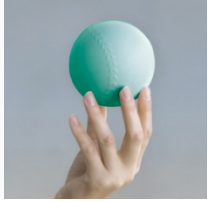


Automated tests

Integration stage rebuilds at least every night

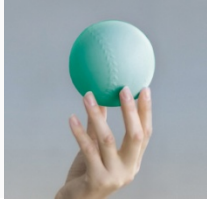
- Integrationtests
  - Functional tests to ensure nameserver could answer all record types we have in our zone
  - Functional tests to ensure nameservice answers during reinstallation
  - Nightly lightweight nameserver software performance tests

Automated tests



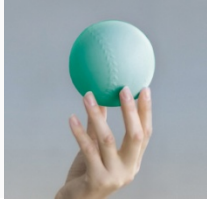
- Smoketests (performed by ansible)
  - All server
    - Installed and functional monitoring, ssh, ntp, passwords correct set, defined hardening standards are fulfilled
  - For each type of server in our NSL special tests
    - Check that all necessary processes are running and responding
    - Nameserver
      - Processes: Check if DSC is installed and running
      - Services:
        - Check if unallowed AXFR possible
        - Nameserver answers at every configured interface

Further Benefits

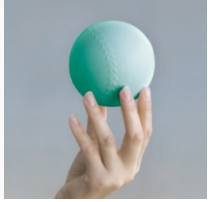


- Goals reached !!
  - Central Admin-GUI
  - Rebuild of a location in 45 min
  - Parallel installation of all locations possible because of serial deployment
  - Production-readyness is ensured through smoketests
  - Automated monitoring integration with templates

Future plans



- Automation of network (SDN) including automated testing
- Automation of hypervisor installations and updates
- Implement additional monitoring and measurements
- Rebuild location faster
- Increasing test coverage



Thank you!

Questions?

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