HTW BERLIN - COMPUTING LABORATORY MOBILE COMPUTING

USING OPENSTACK FOR TEACHING

ABOUT ME

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- until June 2015 department computer laboratory administrator
- since July 2015 research associate - project BB-IT-Boost

THE PROJECT

- OpenStack-installation within the exiting computer laboratory environment
- parallel operation besides ordinary lectures and existing server infrastructure
- enable access for lecturers, students , projects and research
- easy to use, low maintenance, available 24/7
- initiated by Prof. Dr. Hermann Heßling - setup a proof of concept OpenStack infrastructure and offer it to everybody who is interested

THE HARDWARE

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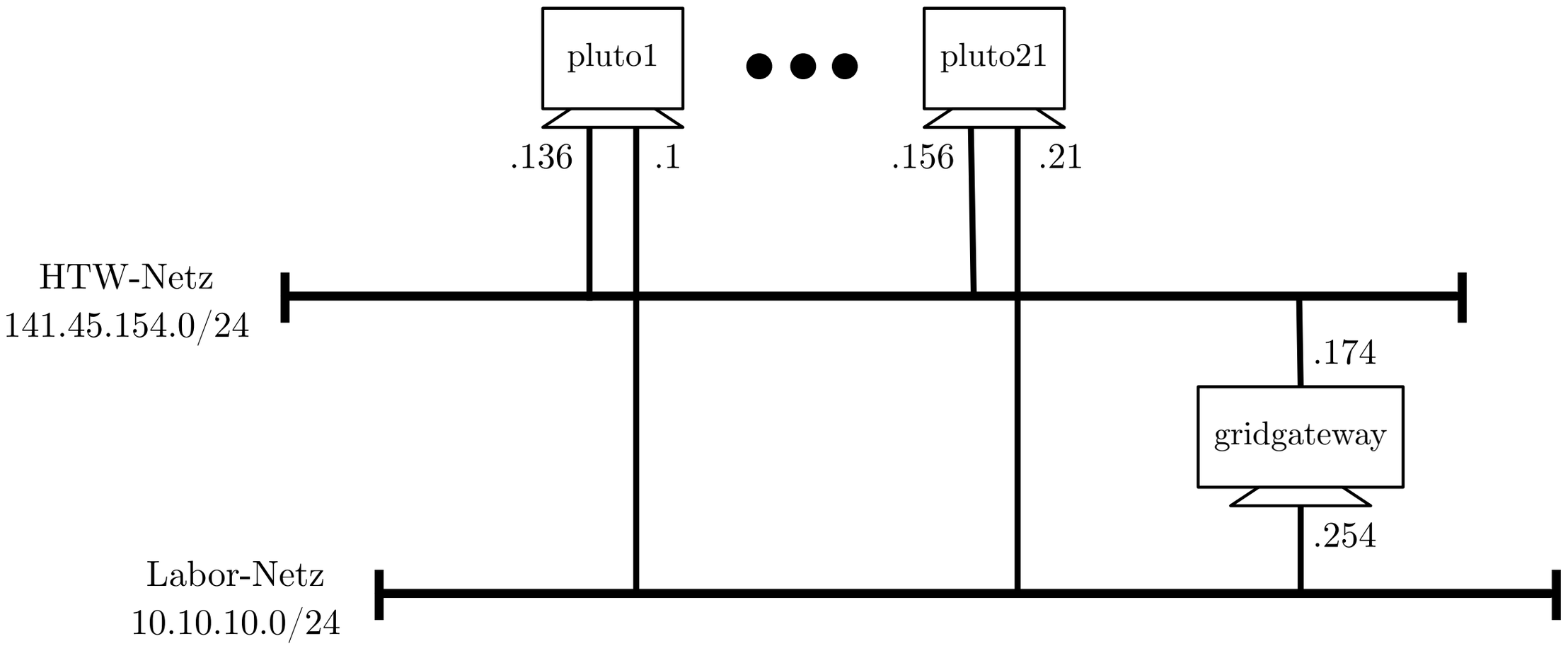
- 20 Dell Optiplex-PC, Core i7 3,4 GHz, 8 GB RAM, 300 GB SSHD partition for virtual machine data
- an additional Dell Optiplex-PC used as server, 256 GB SSD
- systems use dual-boot (Windows 7/ Ubuntu 14.04)
- 2x gigabit ethernet connected to every machine

CHALLENGES I



CHALLENGES I

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CHALLENGES I

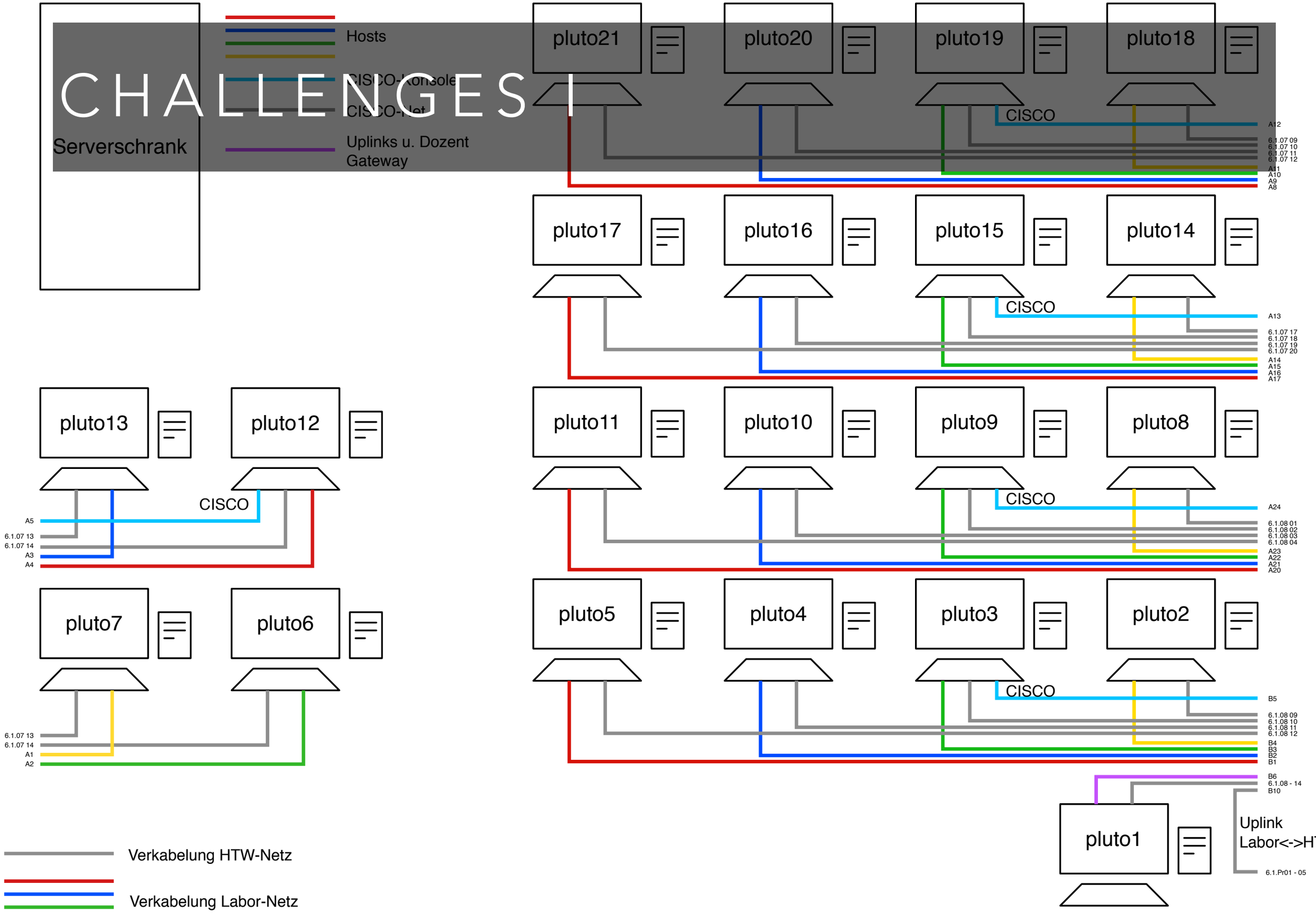
Serverschrank

Hosts

CISCO-Konsole

CISCO-Net

Uplinks u. Dozent
Gateway



Verkabelung HTW-Netz

Verkabelung Labor-Netz

CHALLENGES II

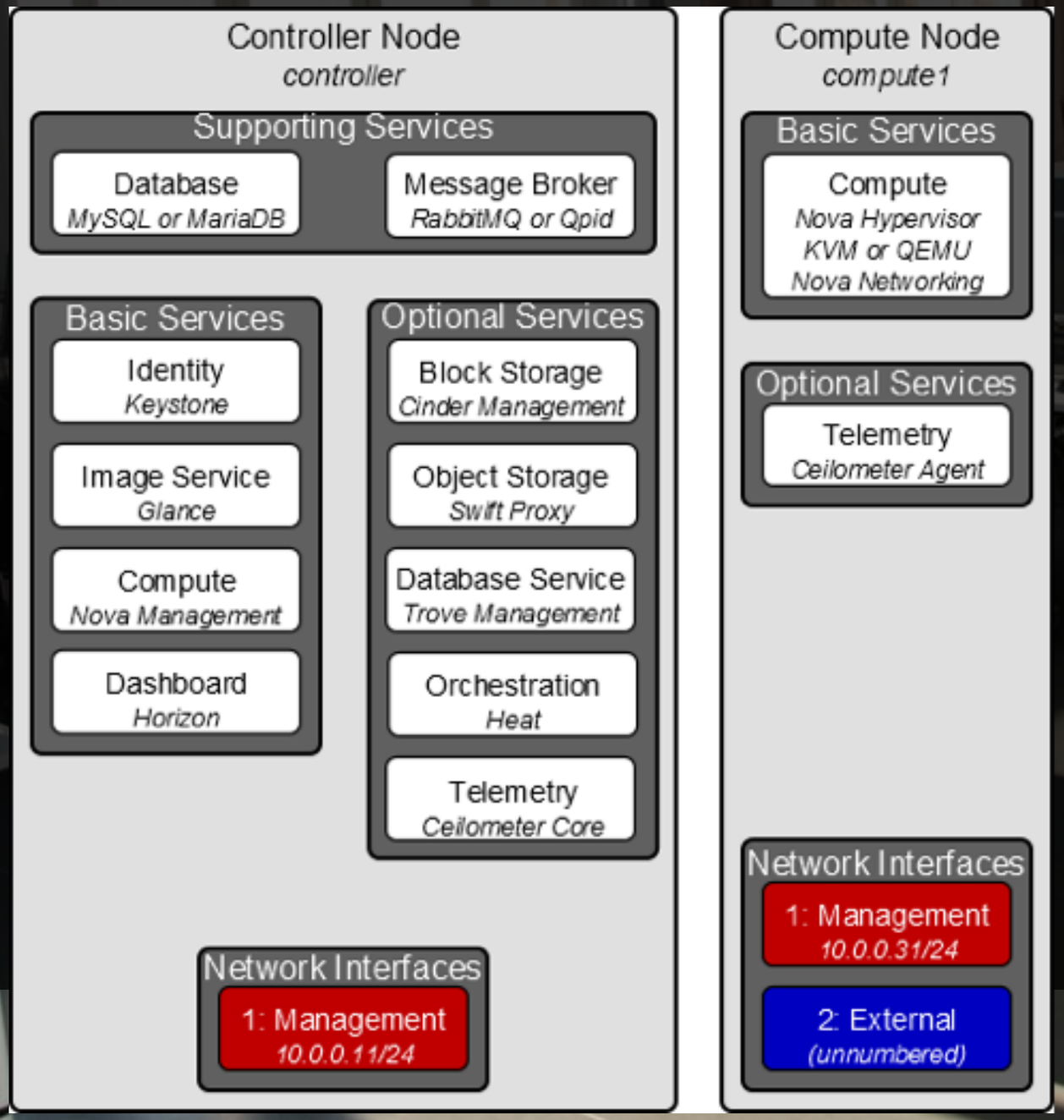
- machines are ordinary desktop computers, which can be freely switched on and off by the users
  - availability and access on weekends and outside the regular schedule
  - dual-boot setup (Windows 7/ Ubuntu 14.04)
  - additional virtualization software VirtualBox
- firewalls, packet filter and access restriction rules that apply when using the public production network

OPENSTACK INSTALLATION

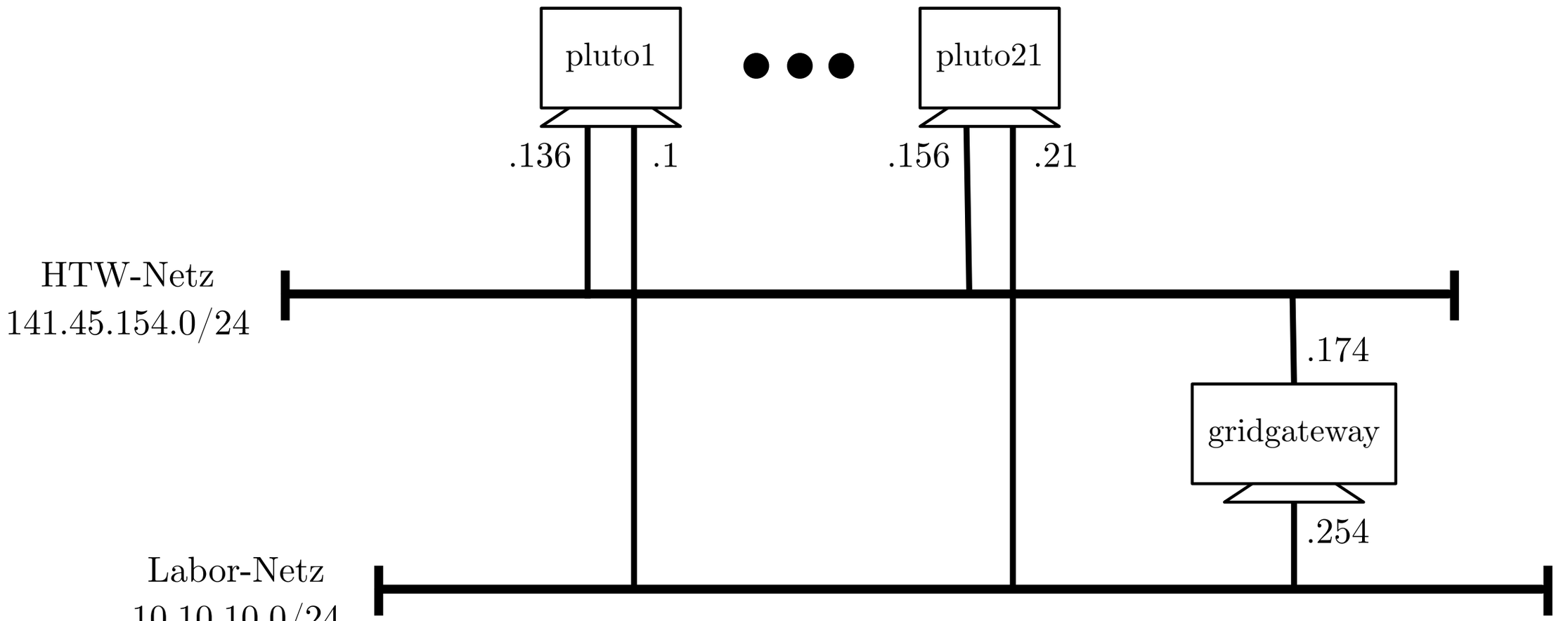
- OpenStack version IceHouse
- installed via Ubuntu 14.04 repository packages
- deployed services
  - Horizon
  - Nova
  - Nova Network
  - Keystone
  - Glance
  - Cinder

OPENSTACK INSTALLATION

- Two-node architecture with legacy networking



OPENSTACK INSTALLATION



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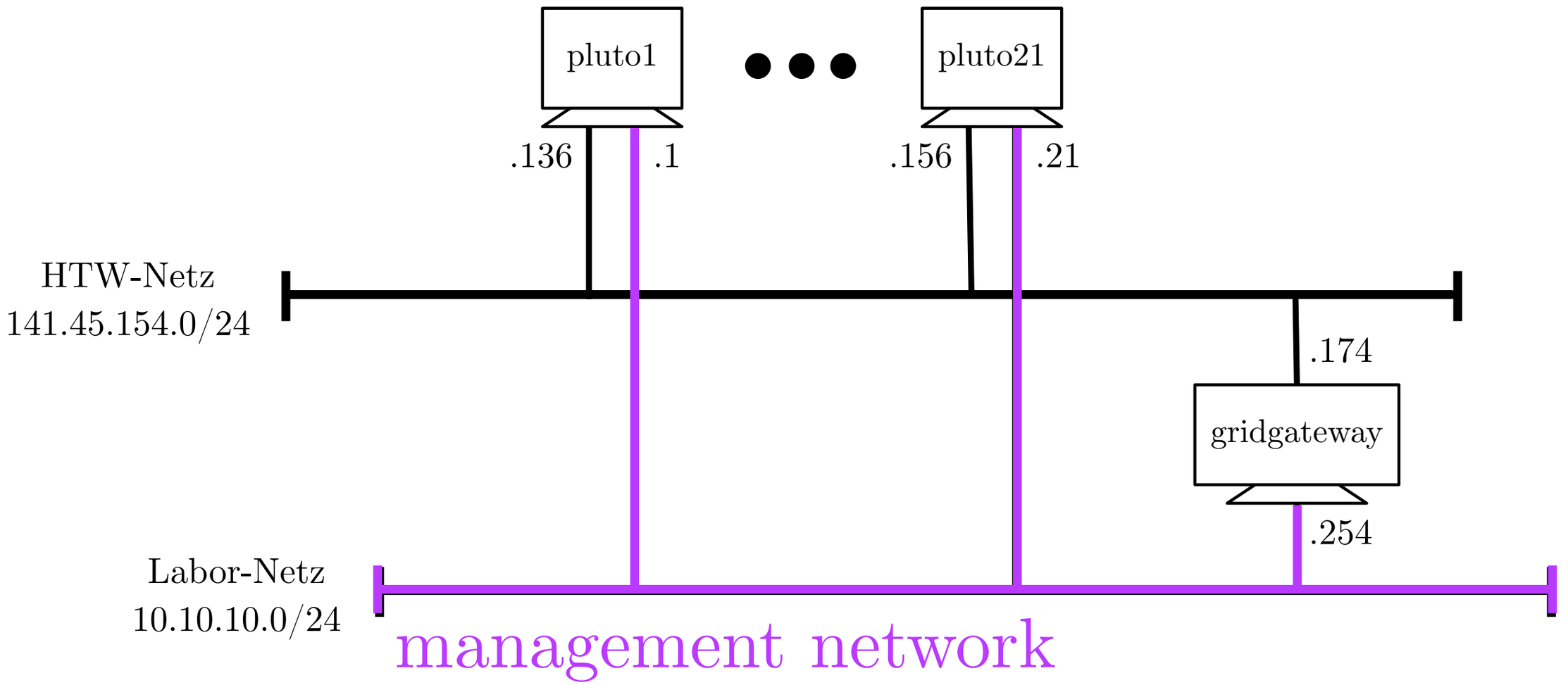

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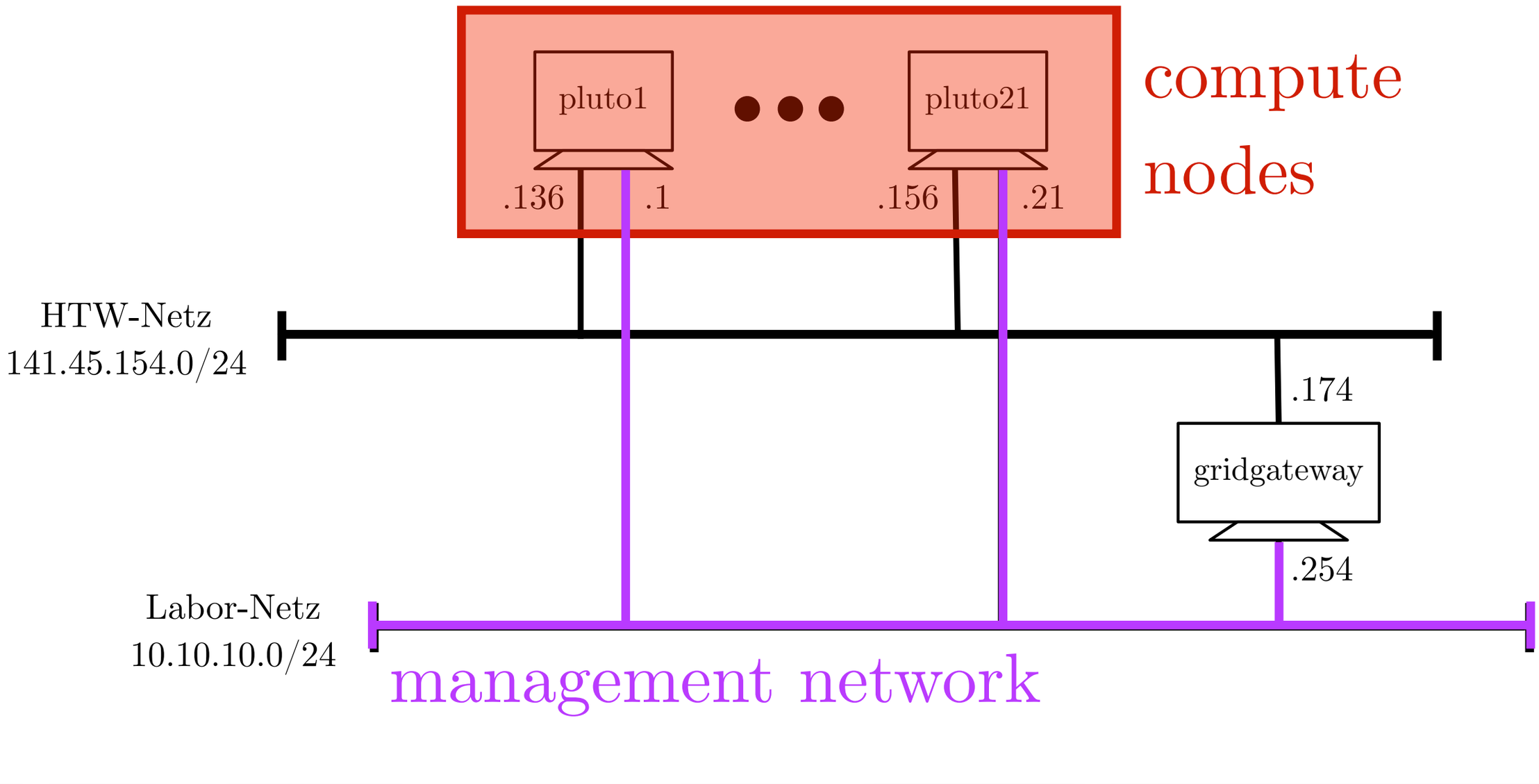
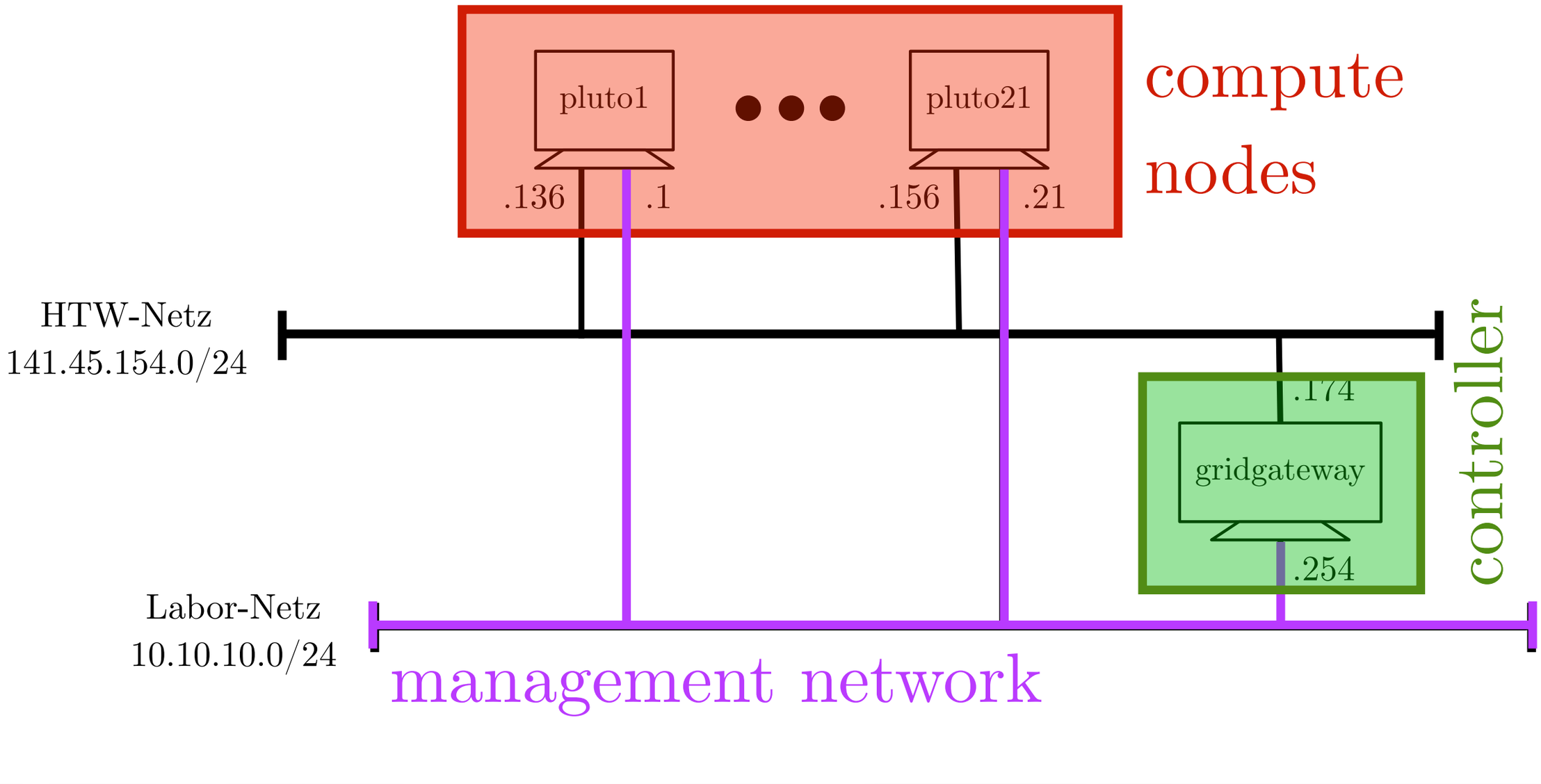


OPENSTACK INSTALLATION



OPENSTACK INSTALLATION

- controller node
  - local MySQL server, each OpenStack service uses its own database
  - installed services: Keystone, Glance, Nova-Management
  - cinder setup:
    - exclusive partition for block storage
    - uses NFS-backend driver to share this partition to compute nodes
- Horizon
  - new tenant for every user/project
  - separate tenant networks for each user/project that may be connected (on demand) to the internal management network

OPENSTACK INSTALLATION

- compute nodes
  - Wake On Lan
  - Keystone, Nova, Nova Network
  - Zustrom scripts that run on boot time to setup configure and setup services
    - client OS can be restores from image anytime via a PXE boot and TFTP image deploy
    - public network authorizes network hardware after a delay of ~3 minutes

USER OPPORTUNITIES

- easy to use/reuse/reset virtual machines with administrative privileges
- custom network configurations to teach network protocols etc.
- allow the deploy of custom os images
  - can be tailored to match exact the teaching requirements by the lecturers
  - no support on custom images

PROOF-OF-CONCEPT

- manual setup of controller node - manages key services and provides internal network access for the OpenStack VMs
- single image of a compute node was created by hand and then deployed via PXE -> nodes configure themselves on boot time via init scripts
- created a tenant with a test network that has access to the internal network
- setup Wake On Lan infrastructure, gateway access for registered users using LDAP authentication
- deployed the Cirrus-VM to all 20 compute nodes to test internal communication and network access -> worked :)

GO-LIVE

- each lecturer (that is going to use the laboratory in the upcoming semester) was send an introduction document introducing the OpenStack installation
- low demand from lecturers and student
- low capacity for additional promotion of the new features
- reduced availability due to the regular usage of the computer laboratory
- conflicts with VirtualBox software -> virtual network devices (network bridged used by KVM and those from VirtualBox seem to be incompatable)
- IPv6-Floods caused by the nova network service caused all internal services to stop working for no reason -> deactivation of the OpenStack service

CONCLUSION

- dedicated high performance server infrastructure is required
- gigabit networking maybe insufficient (depending on requirement)
- don’t use end-user-computers as compute nodes
- don’t allow the user to change cables on your machines!
- objectives and requirements have to be cleared at the beginning of the project