

Operating- and Sustainability Concepts within the G-Lab Experimental Facility (ASP7)

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G-Lab Environment

► Full control over the resources

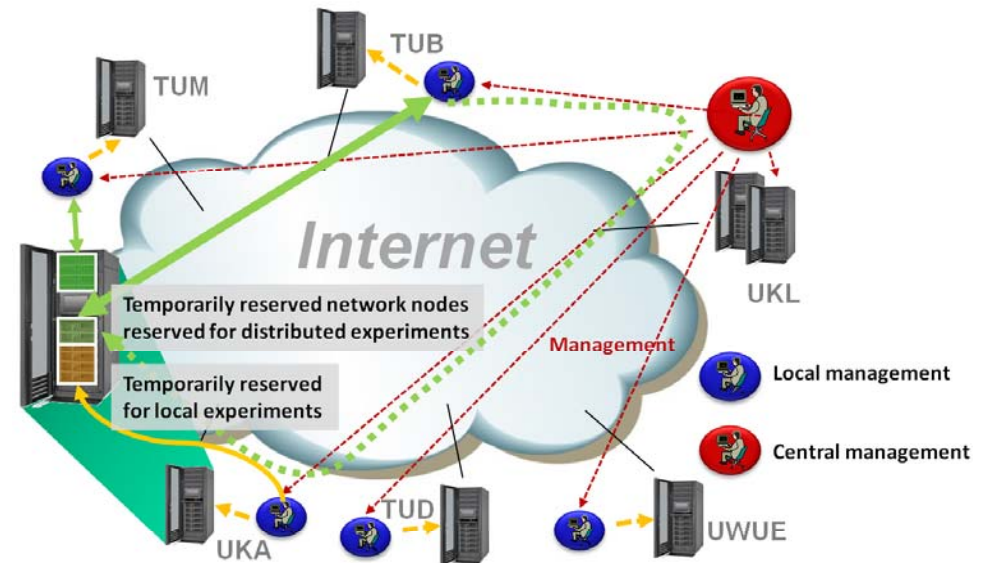
- Reservation of single resources
- Elimination of side effects
- Testing scalability

► Exclusive resource reservation

- Testing QoS / QoE
- Decentralized Resources can be independently used
- Tests on the lower layers of the network without affecting the “life” network

► Extended functionality

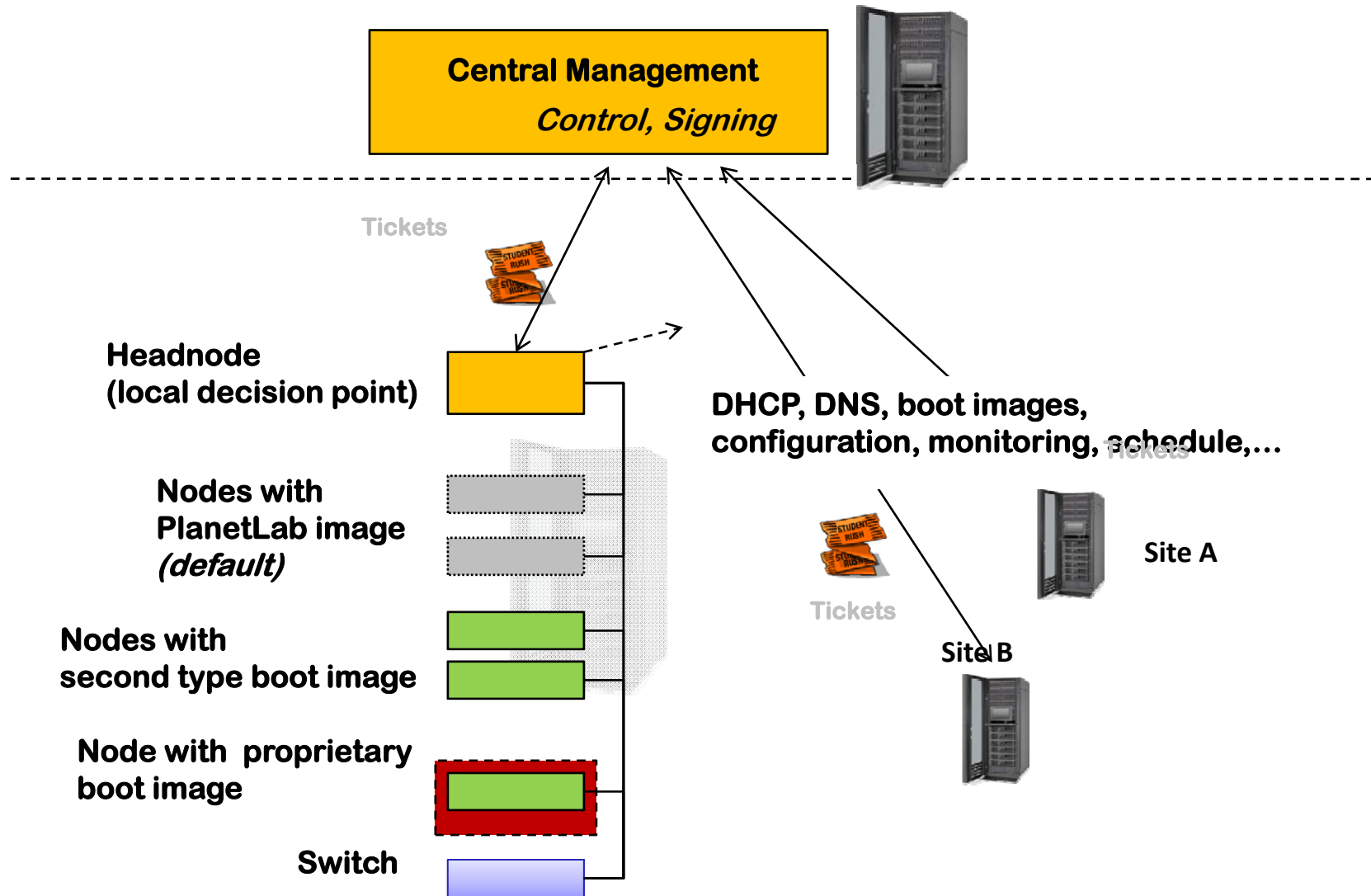
- New technologies (Wireless, Sensor,...)
- Interfaces to other testbeds (G-Lab, PlanetLab Japan, WinLab, ...)



Experimental Facility: Platform

	Remarks
Functionality of the System	Sun Fire X4250 / Sun Fire 4150 All Server support Fedora Core8 and the PlantLab boot image Pro Server: 4x1 Gbit/s on board original Intel-Chipset (MCH 5000P) and Intel NIC's
Cooperation with the G-Lab association	Several alternatives: (see letter of understanding): 1. Center of Excellenz (collaborative 3-D worlds as services for G-Lab or SOA). 2. Cooperation with Sun Labs. 3. Cooperation with Sun Immersion special Interest Group. 4. Joint Conferences (also Cisco give its commitment for cooperation).
Performance	
CPU	Headnode: 2xIntel E5450 QC 3,0 GHz Node typ 1: 2xIntel L5420 QC 2,5 GHz Node typ 2: 2xIntel L5420 QC 2,5 GHz
RAM	All nodes: 16GB (8x2GB DDR2, 667MHz)
Disk	Head node: 12x146 GB (1,72TB) Node types 1&2: 4x146 GB, <i>Hard disks: SAS-Disks 2.5" with 10.000 UPM hot swappable</i>
Network	CISCO Catalyst 4506/03 with Catalyst 4500 Supervisor II-Plus. Port: Uplink je 2 Mini-GBIC 1Gbit/s; Intern: 144/72/48 - 1 Gbit/s (RJ-45) Managementport: 10/100 Ethernet Port
Management	IPMI 2.0 Management, KVM over LAN, CLI, Java-WebGUI Interfaces to: Nagios, BigBrother, Tivoli and OpenView possible
Resource consumption	17,0 KW / 7,6 KW / 4,9 KW

Experimental Facility: Platform



Master Site Specification

▶ UKL master site

- 1 Headnode
 - CPU: 2xIntel E5450 QC 3,0 GHz; Memory: 16 GB; Disk: 12x146 GB (1,72TB)
- 58 Worker Nodes
 - CPU: 2xIntel L5420 QC 2,5 GHz; Memory: 16 GB; Disk: 4x146 GB (SAS, 2,5'', 10.000 rpm)
- Master headnode (daily data backup)
- Central resource management and provisioning
- Master: DNS, IP management, boot image management
- Documentation and Trouble Ticket Management (TRAC)
- Monitoring platform
- Internal and external user management
 - Hierarchical user structure, each site is responsible for its users
 - Administrative steering board decides
 - Access and use policies
 - Teaching support

Local Site Specification

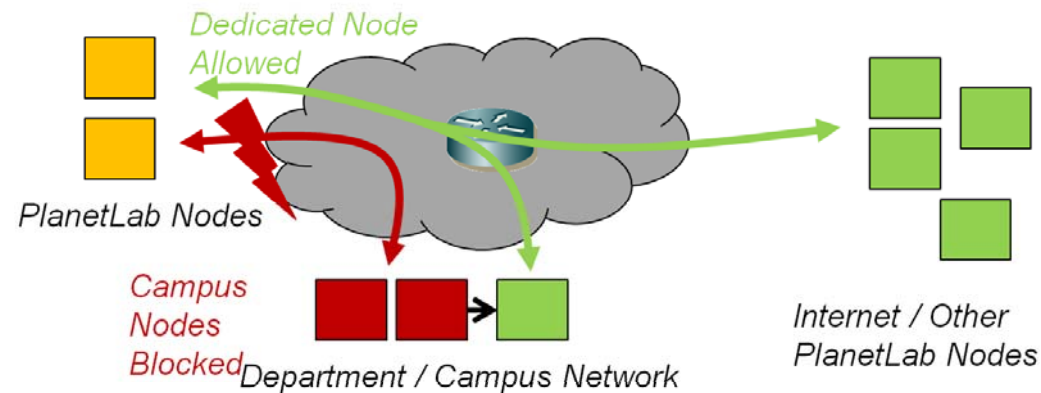
- ▶ Requirements for each local site
 - 25 Nodes (equivalent to the master site)
 - One head node providing
 - Maintained and controlled from master headnode in UKL (local overrides possible)
 - DHCP service
 - Physical interfaces have fixed IP addresses
 - Virtual interfaces access pooled IP addresses
 - DNS service (to be discussed, preventing flooding)
 - Boot Image server (distributes UKL signed images)
 - Default image: PlanetLab
 - Second supported image: other virtualization platform
 - Other: custom images
 - Switch management (port activation, tunneling configuration, bandwidth limits, VLAN)
 - Other nodes as slaves, coordinated by head node
 - Node type 1 (networking node) preferred for networking tests (e.g., network emulation)

Local Configuration Requirements (1)

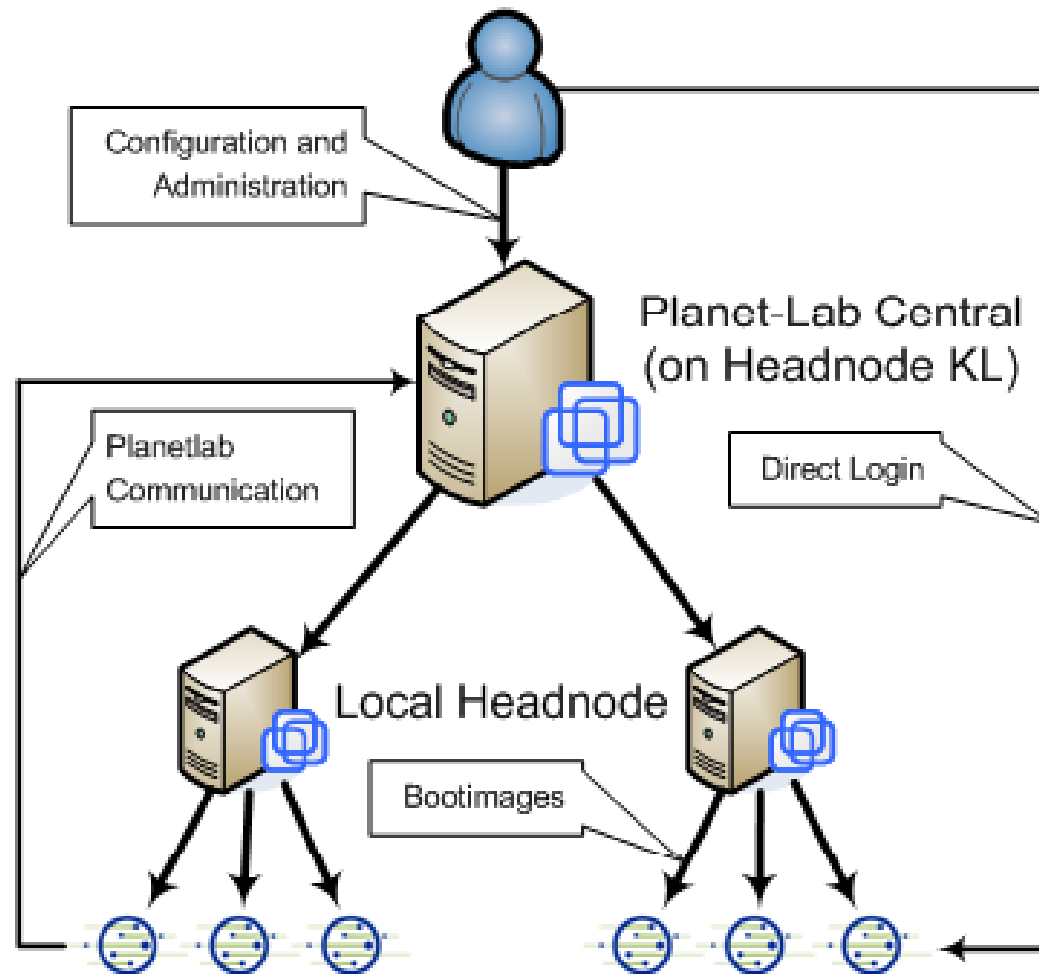
- ▶ Which address infrastructure should be chosen?
 - IPv4 addresses (a class C network is required)
 - IPv6 addresses (requires a compatible infrastructure)
 - Solution: mixed environment of private, IPv4 and IPv6 addresses including the usage of tunneling
- ▶ DNS naming convention
 - G-Lab name ,glab‘
 - Site name
 - Address type
(IPv4/private (i4), IPv4/public (e4), IPv6/private(i6), IPv6/public (e6))
 - Last three numbers of the IP address
 - **Convention:** *glab<short IP>. <add. Type>.<site>*
 - **Example:** *glab030.i4.ukl.german-lab.de*
- ▶ Power supply support (will be checked by each site in cooperation with Sun)

Local Configuration Requirements (2)

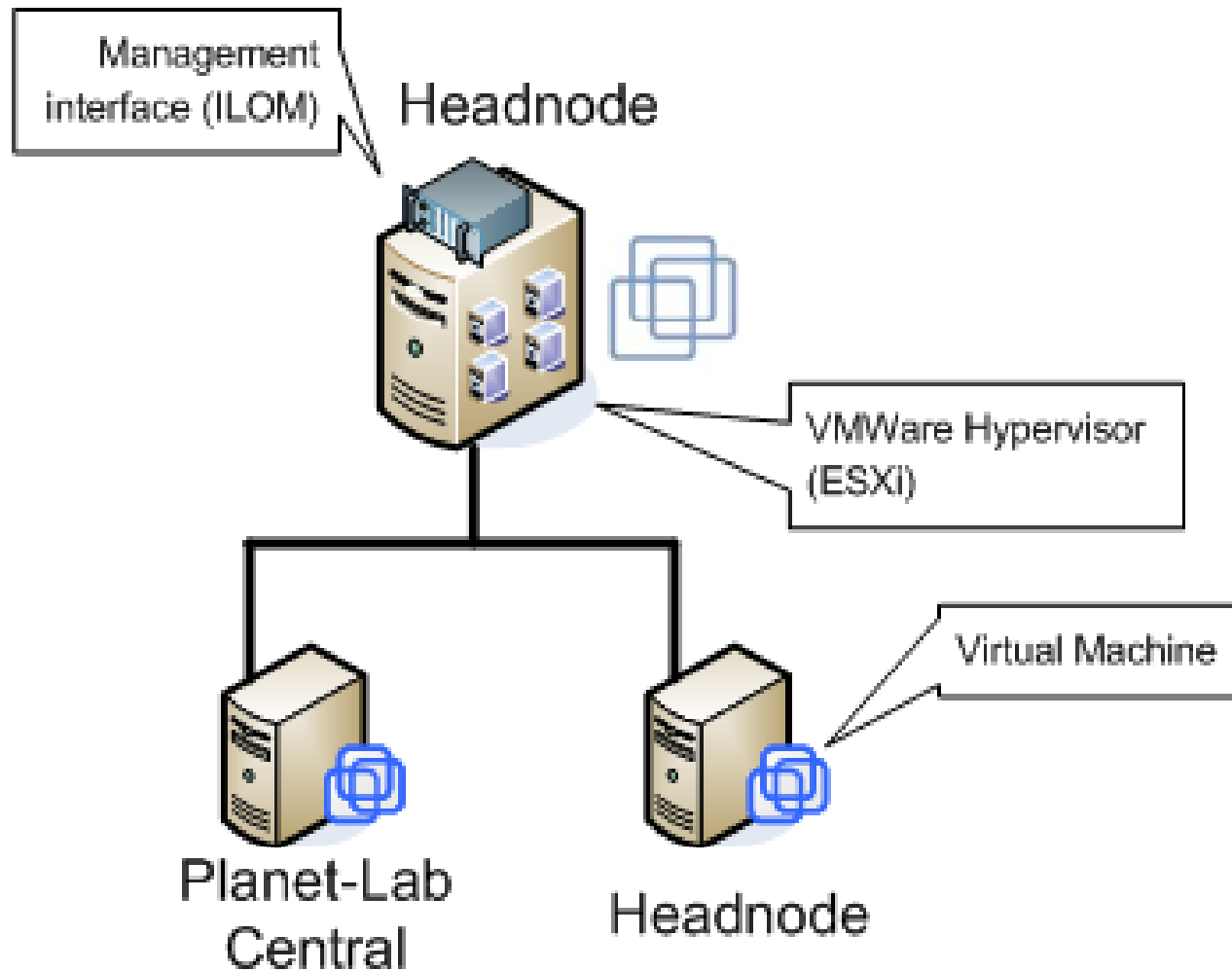
- ▶ Firewall restrictions?
 - Unrestricted public addresses
- ▶ Traffic limitation?
 - Close cooperation with local computing centre
- ▶ Other policies (e.g. traffic types)?
- ▶ G-Lab acceptable use policy (to be done)
- ▶ Local network configuration to be documented (to be done)
- ▶ Proposed solution found at University of Kaiserslautern/Wuerzburg as an example



Cluster Usage



Headnode



Cluster Monitoring

NagVis Map Liste

Orga1 ✔

OrgaKL1 ✔



Nagios
NagVis



NAGIOS
 ADMINISTRATOR



Nagios

Tactical Monitoring Overview
 Last Updated: Fri Jul 3 11:52:17 CEST 2009
 Updated every 90 seconds
 Nagios® 3.0.6 - www.nagios.org
 Logged in as: nagiosadmin

General
 Home
 Documentation

Monitoring
 Tactical Overview
 Service Detail
 Host Detail
 Hostgroup Overview
 Hostgroup Summary
 Hostgroup Grid
 Servicegroup Overview
 Servicegroup Summary
 Servicegroup Grid
 Status Map
 3-D Status Map

Service Problems
 Unhandled
 Host Problems
 Unhandled
 Network Outages

Show Host: _____

Comments
 Downtime

Process Info
 Performance Info
 Scheduling Queue

Reporting
 Trends
 Availability
 Alert Histogram
 Alert History
 Alert Summary
 Notifications
 Event Log

Configuration
 View Config

Network Outages
 0 Outages

Hosts

1 Down	0 Unreachable	125 Up	0 Pending
1 Unhandled Problems			

Services

3 Critical	0 Warning	1 Unknown	376 Ok	0 Pending
2 on Problem Hosts		1 on Problem Hosts		

Monitoring Features

Flap Detection	Notifications	Event Handlers	Active Checks	Passive Checks
Enabled All Services Enabled No Services Flapping All Hosts Enabled No Hosts Flapping	Enabled All Services Enabled All Hosts Enabled	Enabled All Services Enabled All Hosts Enabled	Enabled All Services Enabled All Hosts Enabled	Enabled All Services Enabled All Hosts Enabled

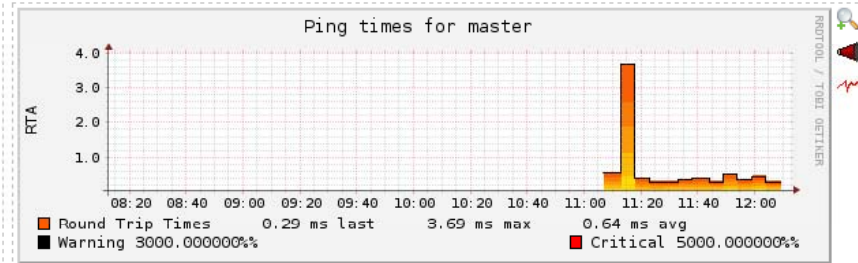
Cluster Monitoring

Host Overview

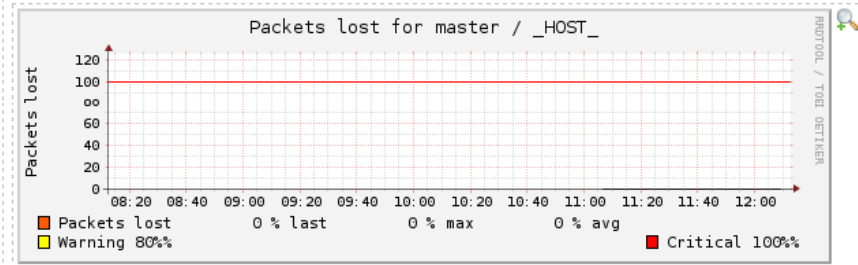
4 Hours (03.07.09 8:12 - 03.07.09 12:12)

Service: Host Perfdats

Datasource: Round Trip Times



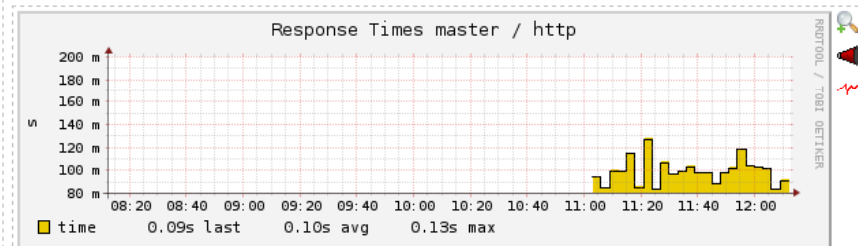
Datasource: Packets Lost



4 Hours (03.07.09 8:12 - 03.07.09 12:12)

Service: http

Datasource: time



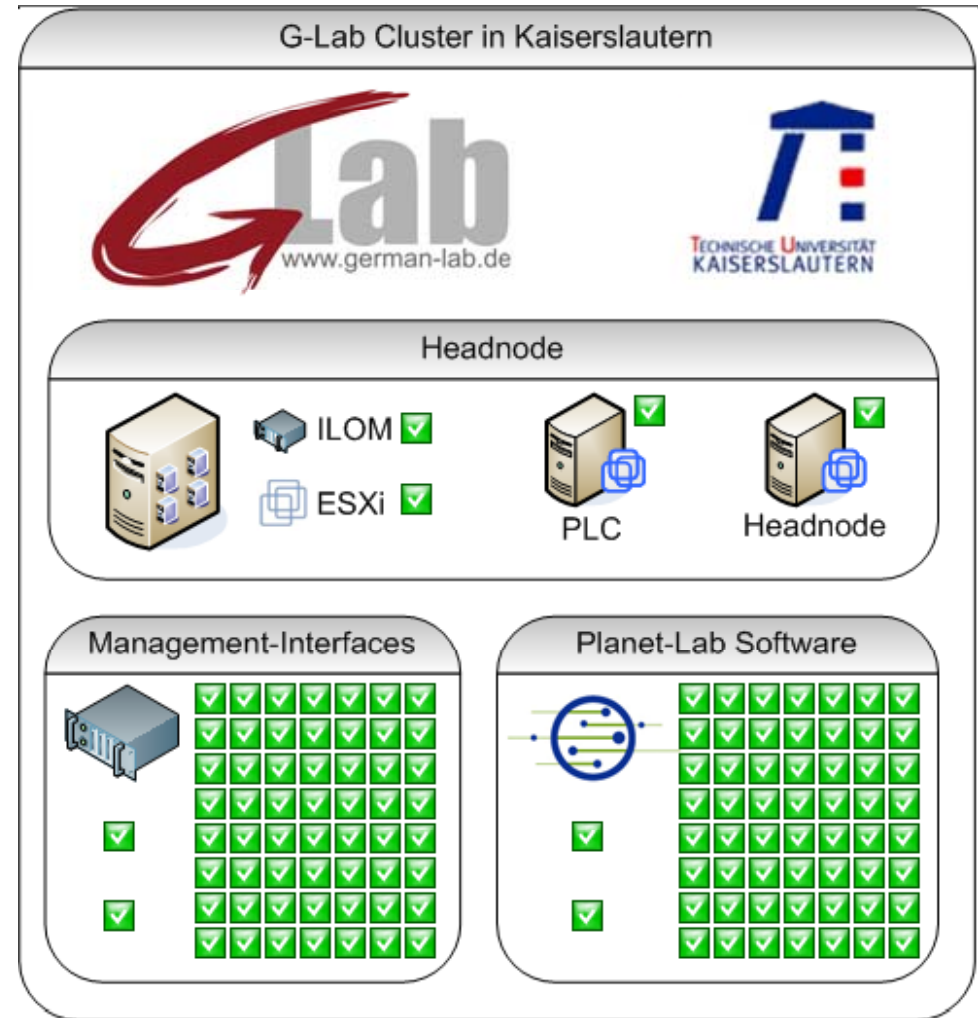
Cluster Monitoring

▶ Head Node

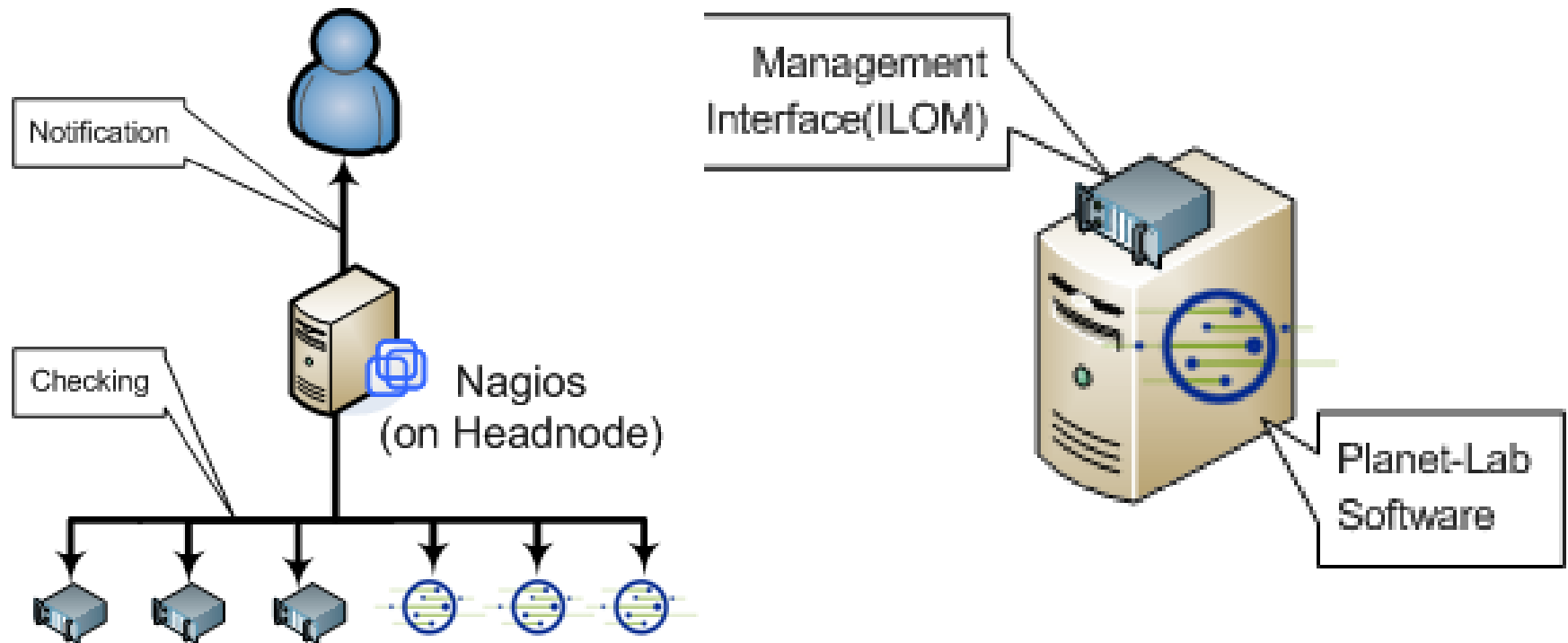
- Management interface (ILOM)
- Virtualized (VMWare ESXi)
- Planet-Lab Central (PLC) as VM
- Headnode System as VM

▶ Worker Nodes

- Management interface
 - Hardware state
- PlantLab Software
 - Reachability




Cluster Monitoring



Cluster Monitoring

G-Lab Cluster in Kaiserslautern



Headnode

ILOM ✓ ESXi ✓ PLC ✓ Headnode ✓

Management-Interfaces

Grid of 20 green checkmarks indicating interface status.

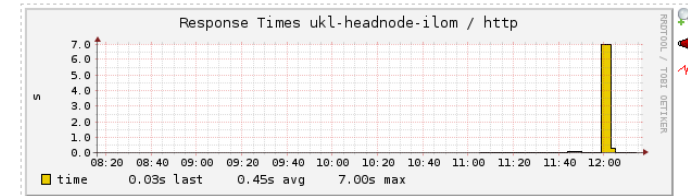
Planet-Lab Software

Grid of 20 green checkmarks indicating software status.

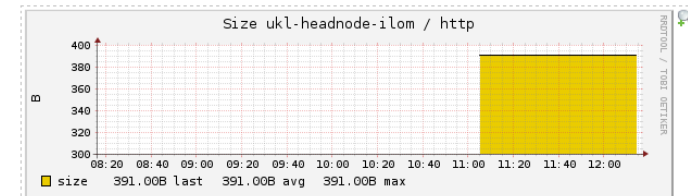
Service Overview

4 Hours (03.07.09 8:15 - 03.07.09 12:15)

Datasource: time

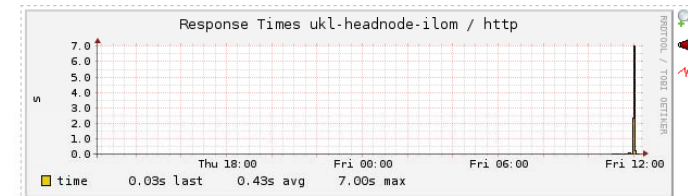


Datasource: size

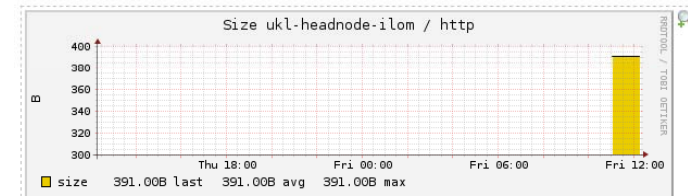


24 Hours (02.07.09 12:15 - 03.07.09 12:15)

Datasource: time



Datasource: size



Current Network Status
 Last Updated: Fri Jul 3 12:15:14 CEST 2009
 Updated every 90 seconds
 Nagios® 2.0.8 - www.nagios.org
 Logged in as nagios@www

[View History For This Host](#)
[View Notifications For This Host](#)
[View Service Status Detail For All Hosts](#)

Host Status Totals

Up	Down	Unreachable	Pending
1	0	0	0

All Problems All Types

0	1
---	---

Service Status Totals

OK	Warning	Unknown	Critical	Pending
4	0	0	0	0

All Problems All Types

0	4
---	---

Service Status Details For Host 'uکل-headnode-ilom'

Host	Service	Status	Last Check	Duration	Attempt	Status Information
uکل-headnode-ilom	http	OK	2009-07-03 12:14:50	3d 23h 56m 46s	1/3	HTTP OK - HTTP/1.0 303 - 0.032 second response time
uکل-headnode-ilom	https	OK	2009-07-03 12:14:58	0d 0h 15m 16s	1/3	HTTP OK - HTTP/1.0 303 - 0.546 second response time
uکل-headnode-ilom	kon	OK	2009-07-03 12:12:55	0d 0h 0m 19s	1/3	OK - No Alarms are active
uکل-headnode-ilom	ssh	OK	2009-07-03 12:13:37	0d 0h 7m 37s	1/3	SSH OK - OpenSSH_3.8.1p1 (protocol 2.0)

G-Lab Association

- ▶ To create sustainability
- ▶ Based on a mutual understanding
- ▶ Who will become a member?
 - Individual membership (Personal; natürliche Person) or
 - Institutional (Universities, Companies, (juristische Person)...))
- ▶ Public Relations
- ▶ Consulting:
 - Workshops
 - Politics (BMBF, EU, ...)
 - Courseware
 - Presentations
 - Services