

**System status**

Host group	Disaster	High	Average	Warning	Information	Not classified
Power Supplies	0	0	0	0	0	0
RAN Servers	0	2	0	0	0	0

Updated: 16:52:07

Host	Issue	Age	Info	Ack	Actions
ASPENDPC5	Filesystem ASPENDPC5:/import is more than 90% full	1m 3d 11h		No	Ok
ASPENDPC5	Filesystem ASPENDPC5:/export/import is more than 90% full	1m 4d 3h		Yes (1)	Ok

## System Monitoring Dashboard Case Study Civil Defense Department in Italy (DPC)

**Presenter: Dr. Mathias Franke**

Kinemetrics, Inc.  
Open Systems & Services  
www.kmioss.com

**Antelope Users  
Group Meeting**

Udine, Italy  
March 12-13, 2015



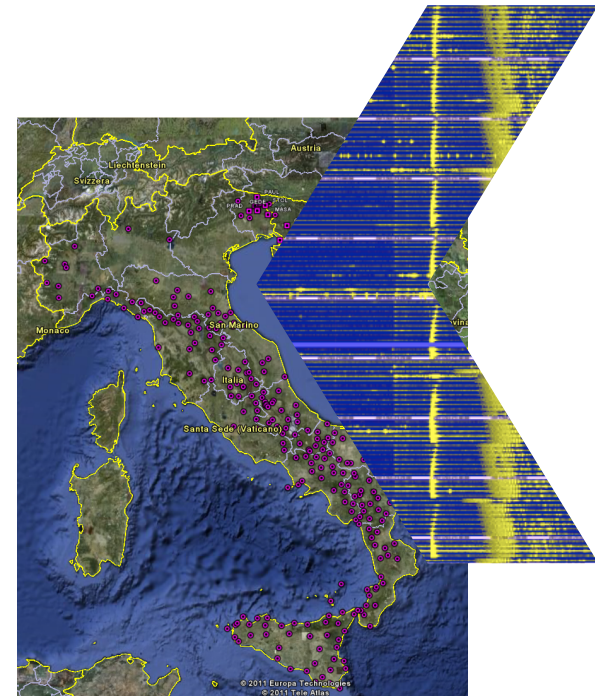
**PROTEZIONE CIVILE**  
Presidenza del Consiglio dei Ministri  
Dipartimento della Protezione Civile



**OPEN SYSTEMS & SERVICES**  
**K I N E M E T R I C S**

# Task: Daily Check of Hardware Condition & Resources

- Check Hardware Resource in order to avoid downtime with proactive response to trending or actual resource limits
- Check Hardware Condition in order to avoid downtime with proactive response to trending or actual fault condition



# Solution: Using Zabbix Monitoring System

- Zabbix is a monitoring solution for networks and applications developed and maintained by Zabbix SIA (<http://www.zabbix.com>).
- It uses **MySQL**, PostgreSQL, SQLite, Oracle or IBM DB2 to store data.
- Its backend is written in C and the web frontend is written in PHP.
- Zabbix offers several monitoring options:
  - Simple checks can verify the availability and responsiveness of standard services such as SMTP or HTTP without installing any software on the monitored host.
  - A Zabbix agent can also be installed on UNIX/Linux and Windows hosts to monitor statistics such as CPU load, network utilization, disk space, etc.
  - As an alternative to installing an agent on hosts, Zabbix includes support for monitoring via **SNMP**, TCP and ICMP checks, as well as over **IPMI**, JMX, SSH, telnet and using custom parameters. Zabbix supports a variety of real-time notification mechanisms, including XMPP.



# What we want to monitor

- CPU utilization
- Memory utilization (physical & virtual)
- File system utilization
- Disk utilization
- Network interface utilization
- Availability of basic system services like sshd, smtpd, ntpd etc.
- DELL iDRAC sensor/health status



# Monitoring Dashboard Development - Requirements

- Apache Web server with PHP Support on monitoring server
- Oracle MySQL Server and Client on monitoring server
- Zabbix Server and Front-end installation on monitoring server
- Zabbix Proxy on monitoring server
- Zabbix Agent and Support Tools on monitoring server & client server
- Some system preparations (Optional RPM repository, dedicated file system for MySQL and deployment with Yum repositories, iptables, /etc/hosts)



# Monitoring Dashboard Development - Customizations

- Kinematics OSS Theme and Support Link
- Colors & Graphic (removal of Zabbix watermark)
- Many small changes that need to be applied to the PHP source code of the front-end
- Kinematics-specific zabbix-web RPM package



# Monitoring Dashboard Development - Customizations

- **Low Level Device Discovery**
  - One of the main arguments for Zabbix as monitoring system is it's ability to use special probes to dynamically update lists of items that need to be monitored.
  - Templates can be kept simple when low-level device discovery is used.
- **Agent Extensions & Templates**
  - 12 new or modified templates (xml files)



# Monitoring System - Items

- Implemented Zabbix based Monitoring System
  - Dashboard
  - Filesystem
  - Performance (CPU, RAM, LOAD, etc.)
  - Event triggers
  - Status details (e.g., UPS)
  - Network maps
  - Event history





# Monitoring System - Dashboard

OPEN SYSTEMS & SERVICES  
KINEMETRICS

Help | Get support | Print | Profile | Logout

Monitoring | Inventory | Reports DPC-DASHBOARD

Dashboard | Overview | Web | Latest data | Triggers | Events | Graphs | Screens | Maps | IT services

History: Host inventory » Host inventory overview » Dashboard » Status of Web monitoring » Overview

PERSONAL DASHBOARD

**Favourite graphs**

No graphs added.

[Graphs »](#)

**Favourite screens**

No screens added.

[Screens »](#)

**Favourite maps**

No maps added.

[Maps »](#)

**System status**

Host group	Disaster	High	Average	Warning	Information	Not classified
<a href="#">Power Supplies</a>	0	0	0	0	0	0
<a href="#">RAN Servers</a>	0	2	0	0	0	0

Updated: 16:52:07

**Host status**

Host group	Without pr	Host	Issue	Age	Info	Ack	Actions
<a href="#">Power Supplies</a>	1	ASPENDPCS	Filesystem ASPENDPCS:/import is more than 90% full	1m 3d 11h		No	Ok
<a href="#">RAN Servers</a>	1	ASPENDPCS	Filesystem ASPENDPCS:/export/import is more than 90% full	1m 4d 3h		Yes (1)	Ok

Updated: 16:53:13

**Last 20 issues**

Host	Issue	Last change	Age	Info	Ack	Actions
<a href="#">ASPENDPCS</a>	Filesystem ASPENDPCS:/import is more than 90% full	05 Feb 2015 04:57:29	1m 3d 11h		No	2
<a href="#">ASPENDPCS</a>	Filesystem ASPENDPCS:/export/import is more than 90% full	04 Feb 2015 13:49:17	1m 4d 3h		Yes (1)	2

2 of 2 issues are shown

Updated: 16:53:13

**Web monitoring**





# Monitoring System – Latest Data

The screenshot shows the 'LATEST DATA' section of the Kinematics Monitoring System. It features a navigation menu at the top with 'Monitoring' selected. Below the menu is a search bar and a breadcrumb trail: 'History: Dashboard > Availability report > Dashboard > Overview > Status of Web monitoring'. The main content area is titled 'LATEST DATA' and includes a filter section with a search box and checkboxes for 'Show items without data' and 'Show details'. Below this is a table with columns: Host, Name, Last check, Last value, Change, and a Graph link. The table lists various CPU metrics for host ASPENDPC4, such as Context Switches Per Second, CPU Idle Time, and Processor Load. Other hosts like ASPENDPC5 and ASPENDPC4 are also listed with their respective item counts for Filesystems and General categories.

Host	Name	Last check	Last value	Change	
ASPENDPC4	CPU (13 Items)				
	Context Switches Per Second	10 Mar 2015 12:16:34	22.09 Ksps	-3.74 Ksps	<a href="#">Graph</a>
	CPU Idle Time	10 Mar 2015 12:16:34	73.93 %	+0.65 %	<a href="#">Graph</a>
	CPU Interrupt Time	10 Mar 2015 12:16:35	0 %	-	<a href="#">Graph</a>
	CPU lowlat Time	10 Mar 2015 12:16:36	0.0058 %	-	<a href="#">Graph</a>
	CPU nice Time	10 Mar 2015 12:16:37	0 %	-	<a href="#">Graph</a>
	CPU softirq Time	10 Mar 2015 12:16:38	0.09 %	-	<a href="#">Graph</a>
	CPU steal Time	10 Mar 2015 12:16:39	0 %	-	<a href="#">Graph</a>
	CPU system Time	10 Mar 2015 12:16:40	17.79 %	+0.7 %	<a href="#">Graph</a>
	CPU user Time	10 Mar 2015 12:16:42	9.22 %	-0.18 %	<a href="#">Graph</a>
	Interrupts Per Second	10 Mar 2015 12:16:29	25.13 Kips	-453 ips	<a href="#">Graph</a>
	Processor Load (1 min average per core)	10 Mar 2015 12:16:31	0.21	+0.03	<a href="#">Graph</a>
	Processor Load (5 min average per core)	10 Mar 2015 12:16:32	0.19	-	<a href="#">Graph</a>
	Processor Load (15 min average per core)	10 Mar 2015 12:16:30	0.19	-	<a href="#">Graph</a>
ASPENDPC5	CPU (13 Items)				
ASPENDPC4	Filesystems (72 Items)				
ASPENDPC5	Filesystems (200 Items)				
ASPENDPC4	General (5 Items)				

# Monitoring System – Triggers

OPEN SYSTEMS & SERVICES  
K I N E M E T R I C S

Help | Get support | Print | Profile | Logout

Monitoring | Inventory | Reports DPC-DASHBOARD

Dashboard | Overview | Web | Latest data | **Triggers** | Events | Graphs | Screens | Maps | IT services

History: Availability report » Dashboard » Overview » Status of Web monitoring » Latest data

STATUS OF TRIGGERS [10 Mar 2015 12:18:21]

**Triggers** Group  Host

Displaying 1 to 2 of 2 found

Filter

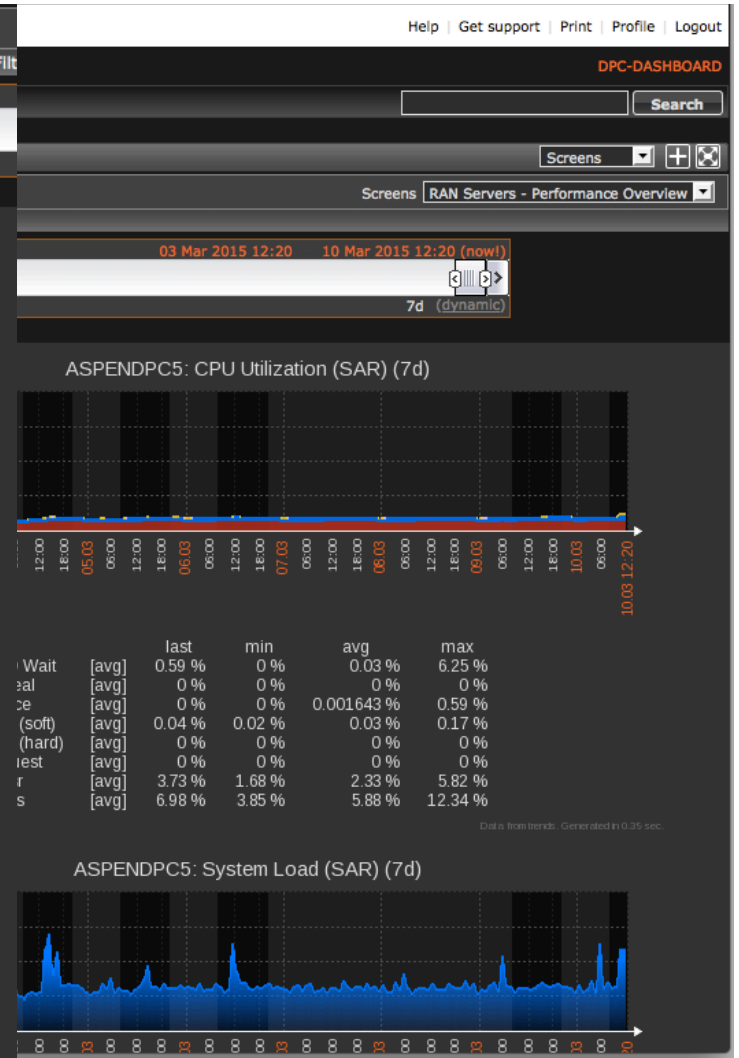
<input type="checkbox"/>	Severity	Status	Info	Last change	Age	Acknowledged	Host	Name	Comments
<input type="checkbox"/>	High	PROBLEM		05 Feb 2015 04:57:29	1m 3d 7h	<a href="#">Acknowledge (2)</a>	ASPENDPC5	Filesystem ASPENDPC5:/import is more than 90% full	<a href="#">Show</a>
<input type="checkbox"/>	High	PROBLEM		04 Feb 2015 13:49:17	1m 3d 22h	<a href="#">Acknowledged</a>	ASPENDPC5	Filesystem ASPENDPC5:/export/import is more than 90% full	<a href="#">Show</a>

Bulk acknowledge

Zabbix 2.2.5 Copyright 2001-2014 by Zabbix SIA Connected as 'mf@kmi.com'



# Monitoring System – Screens



# Monitoring System – Screens

ASPENPC4: Memory Utilization (SAR) (7d)

ASPENPC5: Memory Utilization (SAR) (7d)

ASPENPC4: Swap Space (SAR) (7d)

ASPENPC5: Swap Space (SAR) (7d)

ASPENPC4: IPv4 Sockets (7d)

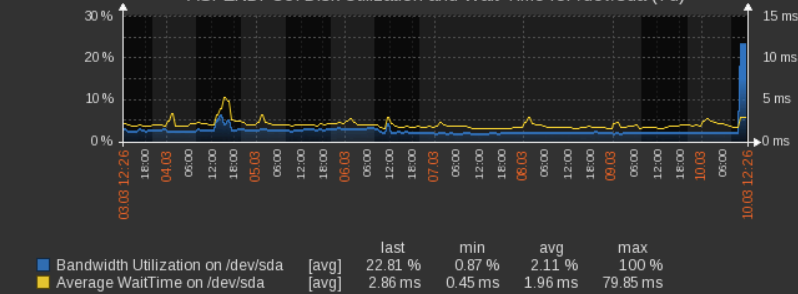
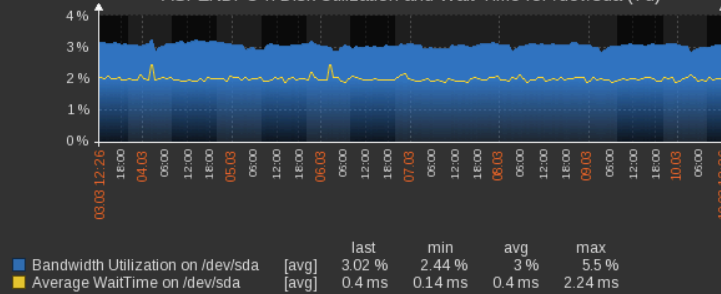
ASPENPC5: IPv4 Sockets (7d)

ASPENPC4: Network Interface bond1 Traffic (7d)

ASPENPC5: Network Interface bond1 Traffic (7d)

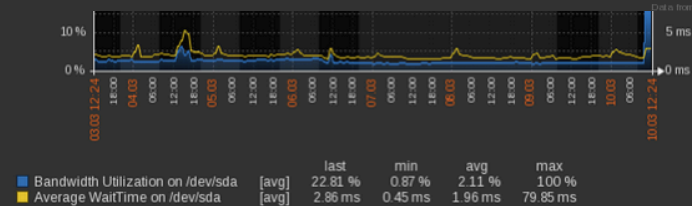
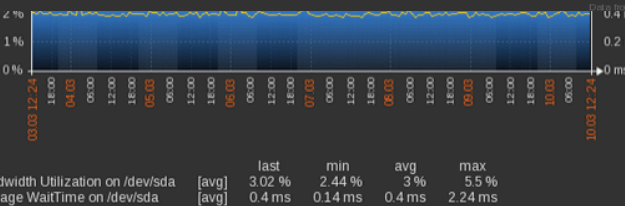
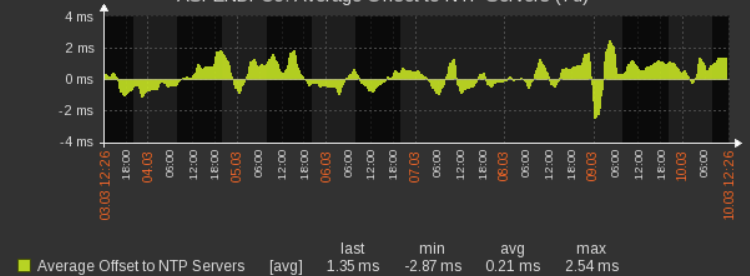
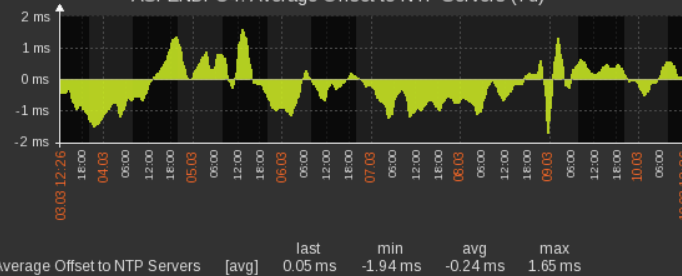
ASPENPC4: Disk Utilization and Wait Time for /dev/sda (7d)

ASPENPC5: Disk Utilization and Wait Time for /dev/sda (7d)

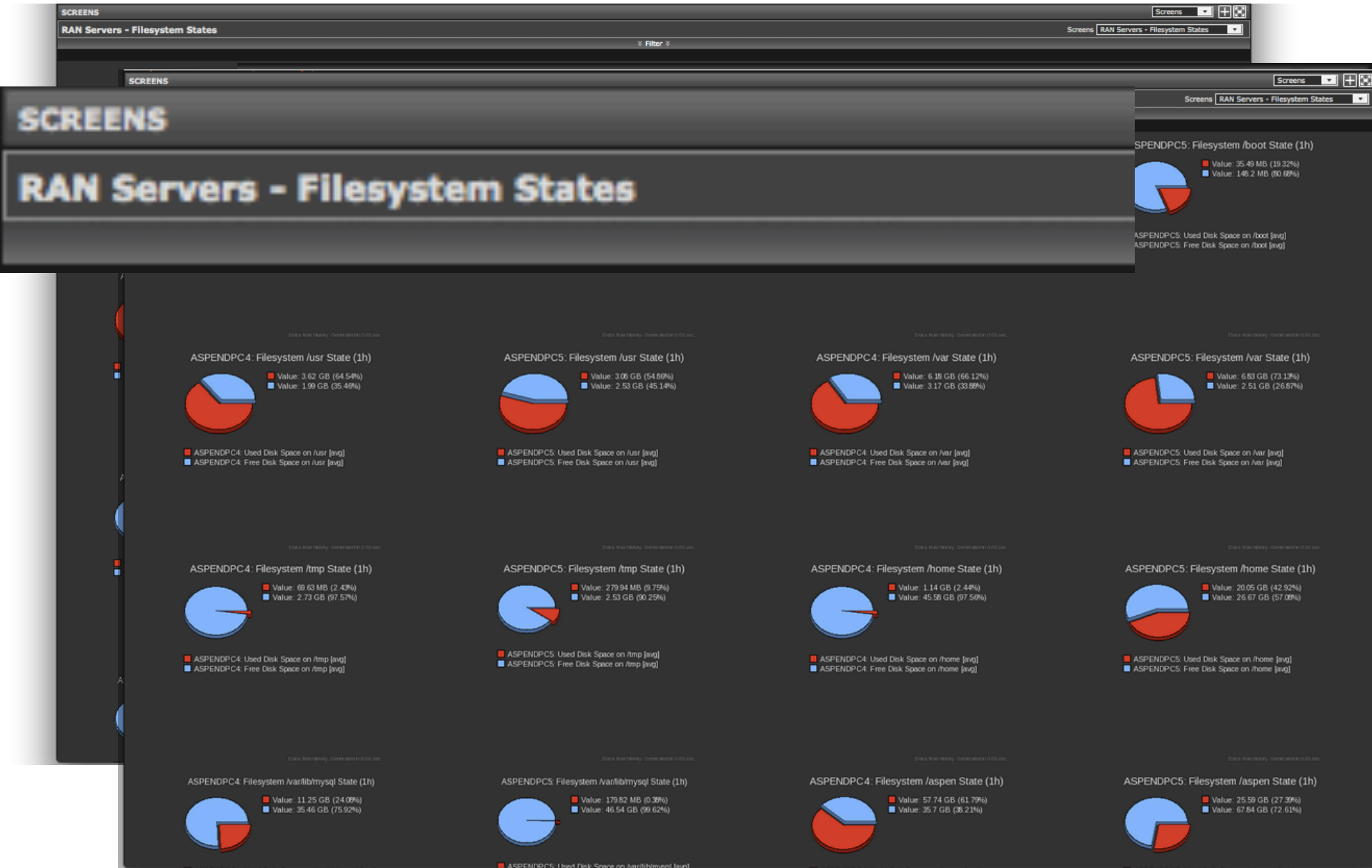


ASPENPC4: Average Offset to NTP Servers (7d)

ASPENPC5: Average Offset to NTP Servers (7d)



# Monitoring System – Screens



# Monitoring System – Reports

OPEN SYSTEMS & SERVICES  
K I N E M E T R I C S

Help | Get support | Print | Profile | Logout

Monitoring | Inventory | **Reports** DPC-DASHBOARD

Availability report | **Triggers top 100** | Bar reports

History: Network maps » IT services » Network maps » Host Inventory overview » Host Inventory

## AVAILABILITY REPORT

Report Mode

Filter

---

OPEN SYSTEMS & SERVICES  
K I N E M E T R I C S

Help | Get support | Print | Profile | Logout

Monitoring | Inventory | **Reports** DPC-DASHBOARD

Availability report | **Triggers top 100** | Bar reports

History: IT services » Network maps » Host Inventory overview » Host Inventory » Availability report

## MOST BUSY TRIGGERS TOP 100

Report Day

Host	Trigger	Severity	Number of status changes
ASPENDDPC5	<a href="#">Filesystem ASPENDDPC5:/nfs/home/sandro is more than 75% full</a>	Average	1
ASPENDDPC5	<a href="#">Filesystem ASPENDDPC5:/nfs/home/sandro is more than 90% full</a>	High	1
ASPENDDPC5	<a href="#">Inodes on filesystem ASPENDDPC5:/nfs/home/sandro are more than 50% used</a>	Average	1
ASPENDDPC5	<a href="#">Inodes on filesystem ASPENDDPC5:/nfs/home/sandro are more than 90% used</a>	High	1
ASPENDDPC5	<a href="#">Size of filesystem ASPENDDPC5:/nfs/home/sandro changed</a>	Information	1
ASPENDDPC5	<a href="#">Total Inodes on ASPENDDPC5:/nfs/home/sandro changed</a>	Information	1

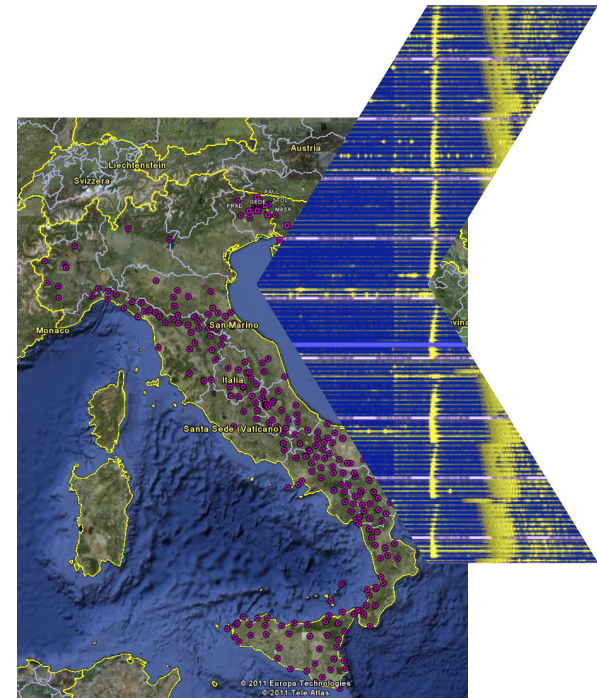
Zabbix 2.2.5 Copyright 2001-2014 by Zabbix SIA Connected as 'mf@kml.com'

ASPENDDPC4	<a href="#">Block Device ASPENDDPC4:/dev/mpathr uses more than 80% of I/O Bandwidth</a>	0.0000%	100.0000%	<a href="#">Show</a>
ASPENDDPC4	<a href="#">Block Device ASPENDDPC4:/dev/mpaths uses more than 80% of I/O Bandwidth</a>	0.0000%	100.0000%	<a href="#">Show</a>
ASPENDDPC4	<a href="#">Block Device ASPENDDPC4:/dev/mpathd uses more than 80% of I/O Bandwidth</a>	0.0000%	100.0000%	<a href="#">Show</a>
ASPENDDPC4	<a href="#">Block Device ASPENDDPC4:/dev/sda uses more than 80% of I/O Bandwidth</a>	0.0000%	100.0000%	<a href="#">Show</a>
ASPENDDPC4	<a href="#">Block Device ASPENDDPC4:/dev/sdb uses more than 80% of I/O Bandwidth</a>	0.0000%	100.0000%	<a href="#">Show</a>





# Thank You



**PROTEZIONE CIVILE**  
Presidenza del Consiglio dei Ministri  
Dipartimento della Protezione Civile



**OPEN SYSTEMS & SERVICES**  
**K I N E M E T R I C S**