



# Software Product Detailed Description

PSGM-1.2.3en

Product: ParaStation GridMonitor 5.0

Date: May 2012 Document number: PSGM-1.2.3en

This software product description documents the functionality provided by the ParaStation GridMonitor 5.0 as well as the system prerequisites required for installation and operation, licensing scheme and other useful information.

# Overview

The ParaStation GridMonitor as part of the *ParaStationV5* cluster suite is a versatile system monitor for Linux-based compute cluster. A multiplicity of information from different devices and services from a cluster may be read, evaluated and stored. The *GridMonitor* provides the administrator with various aspects of the available information, from an overall status of all configured clusters to in-depth details of nodes and devices. Data can be grouped with respect to different aspects and visualized using a web browser.

Furthermore, parameters may constantly be monitored and the administrator may be informed, if required.

ParaStation	GridMonitor								Pagtic martine	
one - « Overview - « Juble 17.							<u>ar</u>	Locure m	<u>ar At</u>	to r
izger Casta	Cluete	ar JuBoPA		-r.;	wipe	at will be lower will	Elovicora	TIDE V	Server (control	d٧
usher Details:										
Tigika New	Foces up 4	10001 (CPUs Icai 2004	91) Noets der	vii 76			Seiser Sitisde I	eno 40.7°6 ;	- 1- 21°6 mat 3	38.4
Paradation Inter Sector		21%				12%				
de Selaire	41	Secold Credit 1	Øy2.	Event tasks	(30 C mar	uts er this last 12 bj				-
Seattrade y				15.5	Mann	Auro	ha	1.5-	tion of Joint	- 0
	1.0			20.00.10	MA11	rensors ratio (+4525), am	cNota ni	010170	monter	
Freemos tare 43			- 18 A.	15:12:82				CLEEPE		-1
	-			20.00.10		sensore control strate en-	INDON 1	C1C171	norter	
their Details:				00.00.40		and a second state of the second		CACATE		
	1.1	10000	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	10.10.10		reno a crio barre. 11.		100000	10,101	
1001.22 Kh		as and telephone	1.1-21-	20.26 10		semantaria da 12 eC2) em	diana 1	616173	10-101	-1
	<b>Baseline</b>			110.00.00				0120.200		
		nut boxte		20.06 10		sensory restrigt sole on	sNoca 1	01.01.70	101101	1
Particular of Barrows	1+1	and the second second		10:07 / 0				0100000		
Advinbledon				20.00 10		rensolatoris (14:37) em	:Nhoa -	010170	monter	
	21	- KA 160	1.000	15:02:82				CIRCLET		- 11
			100	20.00.10		censors reality (4520) are	chhos -	010170	montor	
an an tha an			- 11 - F	1403.82				ener er		
LUDADA	2		5 A.C	20.00 10		cento produ (251-5) em	:Noce	01.01.71	nonter	
JUNOPA		1 A A A A A	56	10000			abbana i	01401401		-
	2	and the second		20100-10		reaso a correlacione de	SPIDC:	0101.71	TRO-FEF	
JUNOPA	<u>;</u>	AN A	sán K	20.00 10		sonsore nosis (25xCC) i ori	:Noc: '	01.01.71	no-ter	
	John (fata	t 730, Khokm 347;								- 6
	police .	MALE?	(ALLAN	<ul> <li>All and a second se second second sec</li></ul>		-A-1	Ave.			- 6
	12/01/2	8	1			HIS	10612060			-1
and the second se	1.000	la.	1			, mu	satisfierder.			-1
	and the second s	in the second	1	67 m m		enc	C 15-Based.			. 9
		100				4201	and the lot that			- ^

# Technical features

### Data gathering process ('collector')

All available data is retrieved and managed by a so called *collector*. All data is retrieved using dedicated agents for each device or service. These agents support various protocols, like e.g. SNMP or IPMI. To minimize overall system and network load, only data requested by a client application is read from the agents by the collector. If no one is interested, no data is transferred and therefore no compute cycles and network bandwidth is used. The collector is especially designed to handle problems like dead nodes, broken network connections and limited network bandwidth, commonly found in cluster environments.

The *collector* gathers various data from different information sources available within a cluster, describing:

- compute nodes,
- file servers and front-end nodes,
- network devices,
- baseboard management controllers,
- storage devices or
- runtime systems.

Available parameters not only include operating system values, like system load, network counters or temperatures, but also parameters supplied by runtime systems like batch queuing systems or *ParaStation*. If available, they may even include information provided by network switches, rack or room environment monitoring devices, uninterruptible power supplies or similar devices.

Each parameter is cached within the *collector* for the configured decay time. Using intelligent caching algorithms, multiple reading of data is avoided.



# **ParaStation**

# ParaStation GridMonitor 5.0

### Software Product Detailed Description

PSGM-1.2.3en

Data can be stored to and retrieved from a database. Thereby, a data history is available, e.g. for plotting diagrams. Parameters and sample frequencies can be configured independently. 'Virtual' parameters can be computed, monitored and stored to the database based on actual read data, e.g. the total system load as sum of all node load values.

Each known numerical value can be compared against an upper and lower limit. In case this value underruns or over-runs those limits, an event will be generated. To constantly monitor these parameters, reading cycles can be defined.

Events describing abnormal situations within a cluster can be generated by monitoring parameter limits, node availability, etc. Events will be stored within the database and reported by email.

Beside the actual data, the *collector* also provides information about the type of available data. Based on this parameter type system, it's easy for a graphical user interface to construct dynamic selection boxes without actually reading the data and thereby wasting network bandwidth and compute cycles. This parameter type system also enables a user interface to include new parameters without modifying the scripts or page layout. E.g., newly added nodes will be recognized and shown automatically.

#### Agents

All data collected by the *collector* is retrieved using agents. Dedicated agents for different services and devices are available. Agents may be installed on monitored nodes (see package *pscollect-agents*) or on the collector node to gather information from remote devices.

Agents are available for

- host parameters (psbase),
- accounting parameters (psacc),
- IPMI parameters (psipmi),
- PBS parameters (pspbs),
- SNMP parameters (built in to collector),
- ParaStation process management parameters (pscollect\_psi)

Agents run as non-privileged user *pscd*. If necessary, particular commands are executed as user *root* using the *sudo* command.

#### Fast import

Sometimes, importing data via pscollector agents infrastructure may not be feasible, especially when data comes in at high frequency. For these cases, a fast-import tool exists that allows loading large chunks of key/value pairs (together with time stamps) to be loaded into the collector's round-robin database at once.

#### Database connectors

At some sites, interesting data like hardware performance counters, or energy consumption measurements may already be available in an external database. The collector allows on-the-fly reading and visualizing data from such databases, without special agents.

Currently, reading from SQLite, MySQL and Postgres databases is supported.

#### Graphical client (GUI)

The graphical user interface (GUI), based on a web server and PHP scripts, gives comfortable access to the data, provided by one or more *collectors*. The information is grouped within various views, like multi-cluster or cluster dedicated overview and details, node overview and details, or cluster-wide parameter lists. Each web browser may be used to display this pages.



## Software Product Detailed Description

Views may be modified by pull-down menus defining the time range for lists and graphs, which icons to show, sort order, or columns to sort by.

The interface also graphical user provides information about currently pending events and event history. Parameters can be graphically shown as history diagrams for periodically sampled data, or bar and radar charts for current data.

Beside the predefined data views, a "parameter browser" is implemented within the graphical user interface. The parameter browser is a generic tool to display each particular parameter known to the collector.

Parameters are organized in a hierarchical way by using table and record entries. Each table provides

ranastation		G	aridMonit		Paulter of the		
lane <u>Owniew</u> -> <u>uilichă</u> <u>150</u>	k28 -> <u>Memory</u>				lagu -	Decimentation	Acout
Arriste Like: Arriste Like: Arriste Like: Samer	Ode: jj23009 vt 300 rsy 3161 NB ve 3165 UD uec 	Hemory Jeans Particle	Lange. Marka at Solation Marka at Solation Marka at Northoles Marka Mark	The sum reads a b tarted etart	κα ( <b>m</b> . ⊽) β	katis 'nva e Invatnikugit tida	isr. Antr v ik i 4 CLEST 20 d rpersone 60-0

indices and parameters, whereas each record only holds parameters. These parameters may be scalar parameters, like integers, floats or strings, or again may be tables or records. Examples for indices are host names or switch names.

ate Bearbonen Ansicht	Gent I	. Lese	scatcher Lit	ras Linsk	dungen	I cnsle:	IIFe					
ParaStation						Gridk	lonit	or			Put	
me Overslew LifficPA	- Intere								Log o	2	ослени.о-	Assul
mean Glaten	0											
rater Details:	Cius	ster:	JUHOPA	۱.						Bert by:	raris e	Eoro Mercin
Derview Physical View	G mien row: 2 1526.8 (2016) Noder us: 2001 (CPC sites: 26069) Noder down: 76								59	na ina	rt i Ang SC i 6.5 D∖os	106 CIS 50 • •n: 12.9
FaraSado-	Parame	tera.										
Eaker Bysker maser Denalis:	0013	.0801 S	C SI manhee (C S	Constants (C	S menned	(2.5) mette		and all defines an an	27 Mar 10 10 10 10 10 10 10 10 10 10 10 10 10			a to control of
a new ward and	joneno.	0.00	24265652	24556328	218408	i:0	9	9	51152909	-	c	10036
boxy ( A L L)				1		e teC	3	5	127651410	6	6	0773961
www.(BECOBC)	Fo.vce	0.00	94965639	57 556226	\$10200		9	5	196778980	0	c.	8/46197
sensers (BECORD)	in the second	11.101	2.6.2646.0714	24.8861156	212.00	- 147			12/00/06/26		6	1020
de (10.00.00)	10000	~~~			1	1:0	2	ő	50130-64	è	č	\$176
ngenz (1611)	[precz	0.00	24286495	24556328	218415		9	9	56171469	0	é.	76.6
ion (TABLE)						- 16	9	9	125020429	C C	c	9246716
onts novces (3017 e miez):	Followee	0.00	2/306564	57 100250	210/20		5	5	126321636	0	0	0246615
(2100)	10.00	0.22		- 	-	100	3	2	55100361	-	с С	7515
01002	Lana			1	1 1 1 1 1 1	110	2		574360-0		2	2/75
11000	101604	0.00	24265093	24556228	2198/2		9	9	47475526	e	c	9129
11057						- 16	9	9	75545207	C C	c	5527711
11005	jonwoo.		24.0012.000	24 8663256	212284	i	:1		Int 17 314-07	a		211.2
21008						- 16C	9	9	12/040240	c	c	8905034
MISCHWINER (CONTINS)	[areas	11.101	74395744	27446-004	212634				12 (2010) (0		e	1094121114
Add (5.0/1)						1:0	2		5517-728		6	1019
nentes (JIN)	La.wa		5757 <b>6</b> 700	Section 1911	2100.04	A.14			1000110106			Set office
Carriels (UIV) Carriels (UIV) In device (UIV) Carriels (UIV						129	,	5	901/2104	2	e	2345
. · · · · · · · · · · · · · · · · · · ·	1											

Parameters may be provided by each data source known to the collector, therefore the parameter browser is e.g. also a SNMP (or MIB) browser. The data source is transparent to the parameter browser; therefore the user does not have to take care from which source the actual data is read. Arbitrary parameters may be shown together, like network counters of a node and switch.

The selected data is shown using a matrix layout, similar to a calculation sheet. It is organized in rows and columns, where the scalar parameters and indices show up in columns. Using pull-down menus, the matrix may be sorted increasing or decreasing by columns. Column data may be visualized using diagrams.

#### Software packaging

The GridMonitor is available as four RPM packages, ready for installation. These packages are:

- pscollect: includes the central collector, database and local agents, ٠
- pscollect-agents: commonly used agents installed on monitored nodes, •
- psaridmon: comprises all PHP scripts and configuration files for the web server providing the graphical user interface,
- psgridmon-doc: provides all the documentation (HTML, PDF and man pages).

The *pscollect* package is installed on the management node, whereas the *pscollect-agents* package is required on all cluster nodes. The *psgridmon* packages must be installed on the web server node. Installing the *psgridmon-doc* packages is not required, but highly recommended. In particular, installing this package on the web server will provide online documentation within the *GridMonitor*.



# PSGM-1.2.3en





### Software Product Detailed Description

PSGM-1.2.3en

### Documentation

The documentation is available as a separate, installable package called *psgridmon-doc*. It includes:

- *GridMonitor Administrator's Guide* (English, PDF and HTML format),
- Manual pages describing the *GridMonitor* programs (English, groff format).

#### **Supported Environments**

#### Cluster nodes, management node

The management node requires a recent Linux version. Supported are x86 and x86\_64 architectures. For cluster nodes, all versions and architectures are supported. For a cluster node, the GridMonitor requires a Linux kernel version 2.6, but no particular distribution or architecture.

The management node does not require an installed database, as this is part of the *pscollect* package.

#### Network switches

Additional monitored devices, in particular network switches, have to provide information using SNMP. Standard MIBs (SNMPv2-MIB, IF-MIB) must be supported. Manufacturer specific MIBs may be supported upon request.

#### Baseboard Management Controllers (BMCs)

BMCs providing an IPMI V2.0 interface may be queried to retrieve system information for servers like SDR, SEL or FRU, independently of the state of the server.

#### Other monitored devices

More devices like RAID arrays, Infiniband switches or similar providing SNMP-based status information may be supported upon request.

#### Runtime environments

The *GridMonitor* supports the *ParaStation* process environment. Job information will be shown within the appropriate views. In addition, OpenPBS, Torque and PBSPro batch queuing systems are supported. Information about jobs and queues managed by those systems are shown within the *GridMonitor*.

#### Web server, browser

The *GridMonitor* requires an Apache web server, version 2.0 or later, providing mod-php support. Currently, only Linux-based environments are tested.

A decent browser may be used to display the information. JavaScript is required for navigation, but no frames are used.

### License

The *GridMonitor* is copyright © by ParTec Cluster Competence Center GmbH. Usage is only permitted with a valid license agreement.

### Media

All *GridMonitor* packages are available in binary format for x86 and x86\_64 architectures. The packages are available in the download area of ParTec Cluster Competence Center's web server www.par-tec.com.

#### Support

After signing a support contract, support for all packages is granted for the agreed period of time. The maximum response time is one working day. Support is performed by telephone, email, and/or remote login. Onsite support at the installation site is not included.

The support comprises all *GridMonitor* components as well as the open source software utilized (if applicable).





Software Product Detailed Description

# Scope of delivery

The ParaStation GridMonitor comprises of the following components:

- Software packages (see above),
- Documentation (ParaStation GridMonitor Administrator's Guide) in electronic format,
- Support as agreed in the support contract.

# Copyright

ParTec, ParaStation and *ParaStationV5* are registered trademarks of ParTec Cluster Competence Center GmbH. All other product and brand names are trademarks or registered trademarks of their respective owners.

The information in this version of the software product detailed description is valid as from the time of publishing. Errors & omissions excluded.

# **Further information**

For further information about the ParaStation GridMonitor visit http://www.par-tec.com or send an email to sales@par-tec.com.