



Monitoring servers via Redfish

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Bechtle GmbH & Co. KG Chemnitz

About myself & Bechtle

- something with IT since 1995
- working at Bechtle from 1999
- our own monitoring systems on Nagios basis from 2006 onwards
- Checkmk first usage 2009 after OSMC in Nürnberg
- Checkmk partner since 2015
- Checkmk Gold Partner
- > 150 directly supported Checkmk customers via Bechtle Chemnitz

Our work with Checkmk

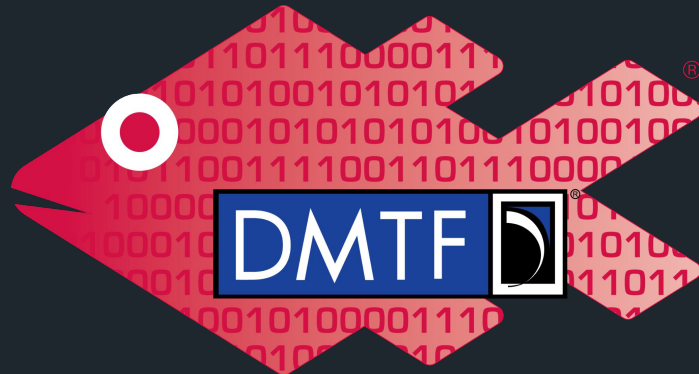
or what we build over the last decade

- actively build extensions for our needs to support the customers
- my colleagues build extensions for
 - Netapp eSeries (@aeckstein)
 - Cisco Meraki, Network topology data processing and many more network related things (@thl-cmk)
- I build extensions for
 - Nutanix (already included with Checkmk 2.3)
 - Hyper-V
 - Redfish (now part of Checkmk 2.4)

Redfish what is it

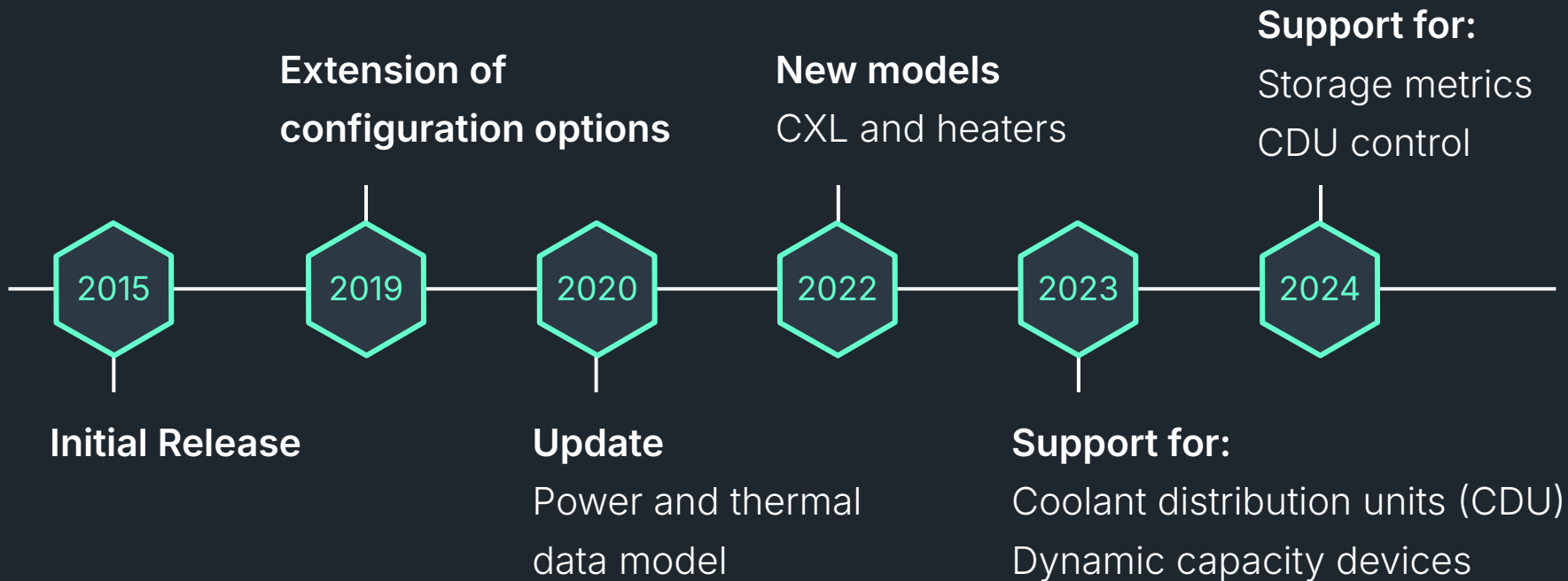
A short introduction

- Tool for operations to work with hardware like it is software
- Industry Standard Software Defined Management for Converged, Hybrid IT
 - HTTPS in JSON format based on OData v4
 - Schema-backed but human-readable
- A secure, multi-node capable replacement for IPMI-over-LAN
- Managing servers, data center infrastructure, and more, not only monitoring



Redfish

Timeline



Support and Tools



- Mockup creator
- Simulator for pre-build or own created mockups
- Checker for own implementations
- Mockups available for
 - Rack mounted servers
 - Bladed systems
 - Generic profile

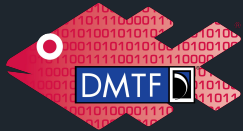
Explore the Resources

- Main
- Systems
 - 437XR1138R2
- Chassis
- Managers
- Task Service
- Session Service
- Account Service
- Event Service
- Update Service

Normative requirements

```
redfish » v1 » Systems » 437XR1138R2
  "@odata.type": "#ComputerSystem.v1_24_0.ComputerSystem",
  "Id": "437XR1138R2",
  "Name": "WebFrontEnd483",
  "SystemType": "Physical",
  "AssetTag": "Chicago-452-2381",
  "Manufacturer": "Contoso",
  "Model": "3500",
  "SubModel": "RX",
  "SKU": "8675309",
  "SerialNumber": "437XR1138R2",
  "PartNumber": "224071-J23",
  "Description": "Web Front End node",
  "UUID": "38947555-7742-3448-3784-823347823834",
  "HostName": "web483",
  "Status": {
    "State": "Enabled",
    "Health": "OK",
    "HealthRollup": "OK"
  },
```

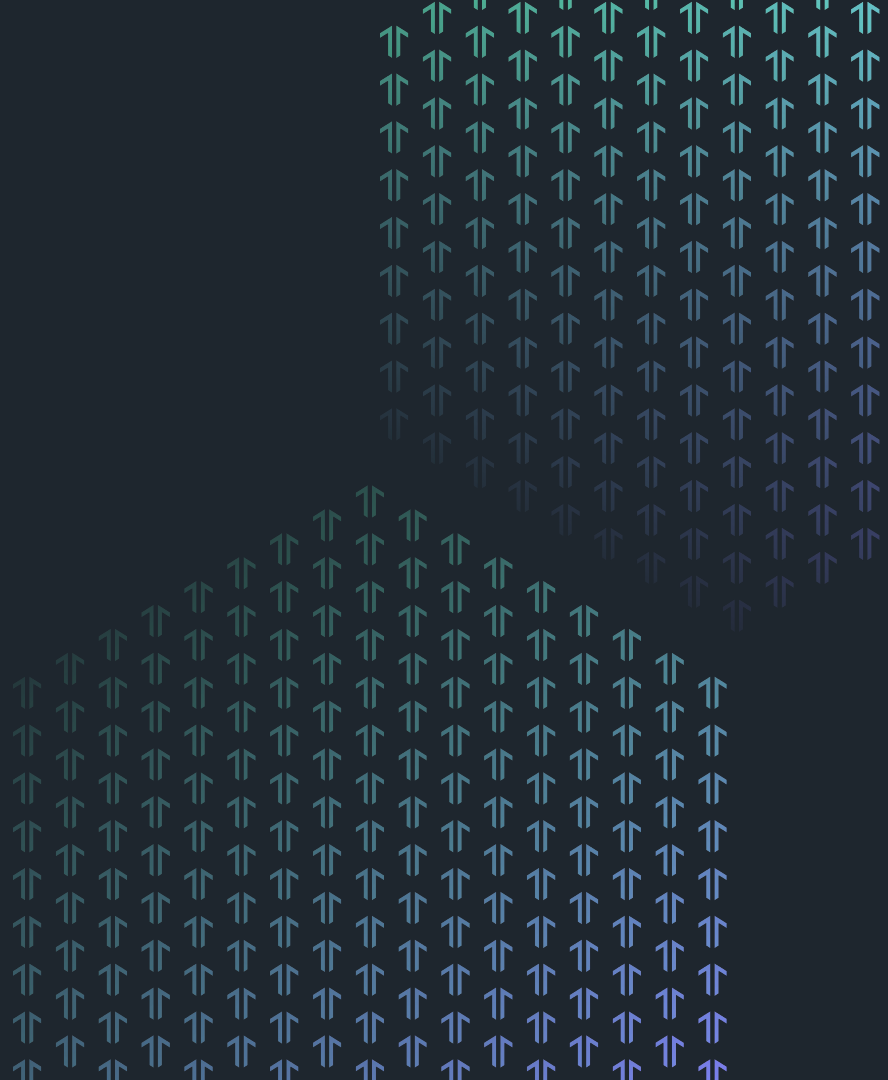
Redfish x Checkmk



Redfish



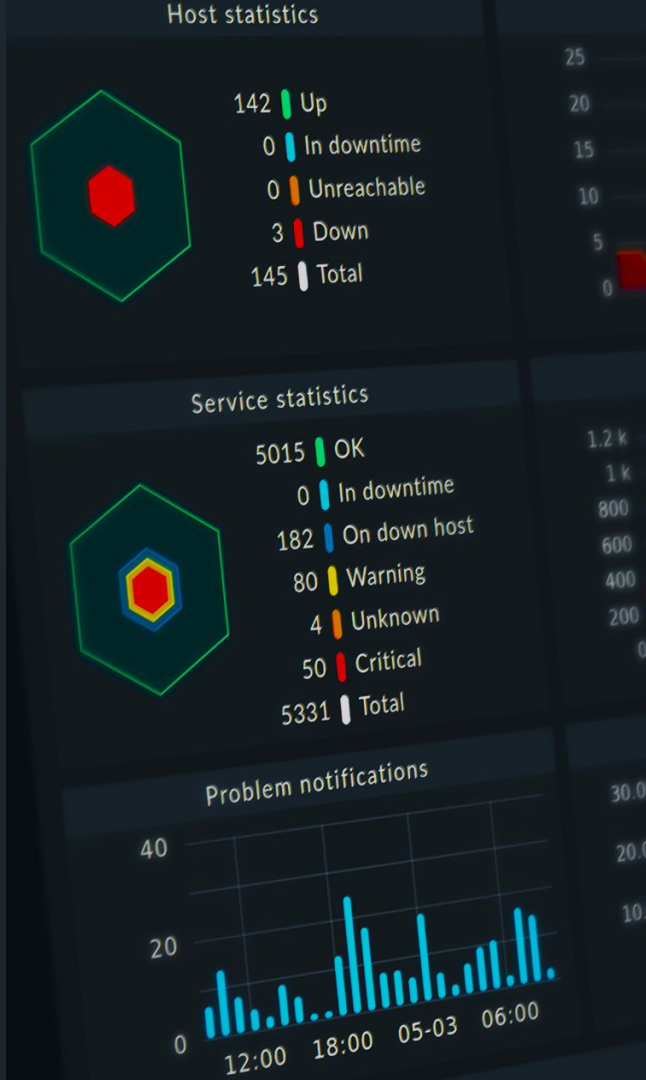
checkmk



Redfish x Checkmk

or how it all began

- 2016 - HPE iLO 4 - basic special agent and checks
 - CPU, fans, memory, drives, power, temperature & raid
- End 2020 - Lenovo xClarity
- End 2021 - Dell iDRAC
- 2022 thoughts about unified special agent to decrease the support workload
- May 2022 - first version of unified Redfish agent
- working on integration to support more and more manufacturers



Supported Manufacturers

also DMTF board members



Hewlett Packard
Enterprise



Lenovo



intel®

Other supported Manufacturers

implementing Redfish

Raritan[®]
A brand of **legrand**



FUJITSU

Core components



- 2 special agents
 - Generic management interfaces (iLO, iDRAC, xClarity)
 - PDU (power distribution unit) equipment (Raritan)
- missing agent for CDU (coolant distribution units)
 - no chance to get my hands on such devices
- checks for the found sensors
- very basic HW/SW inventory



Integration



Up to version 2.3

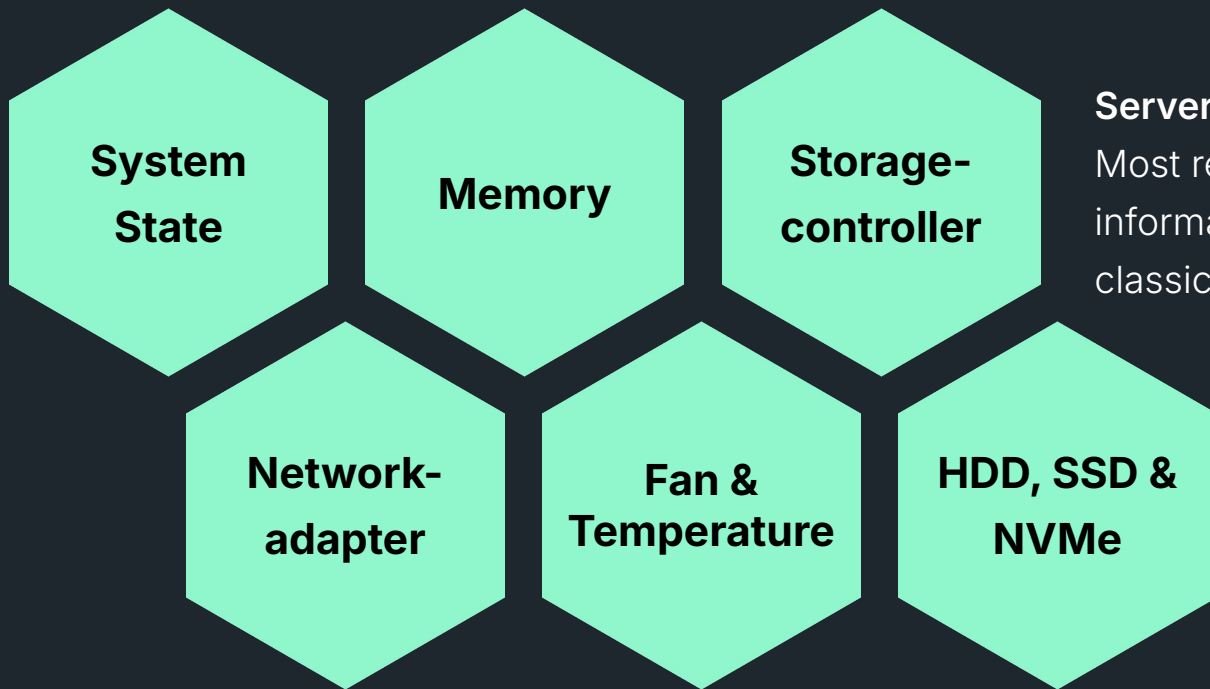
- Installation with Extension (MKP)
 - different versions for every major update
 - difficult to maintain over time

With version 2.4

- Mainlined as an out-of-the box Checkmk monitoring plugin
 - no manual update anymore
- build as plugin and easily extensible

Current state server monitoring

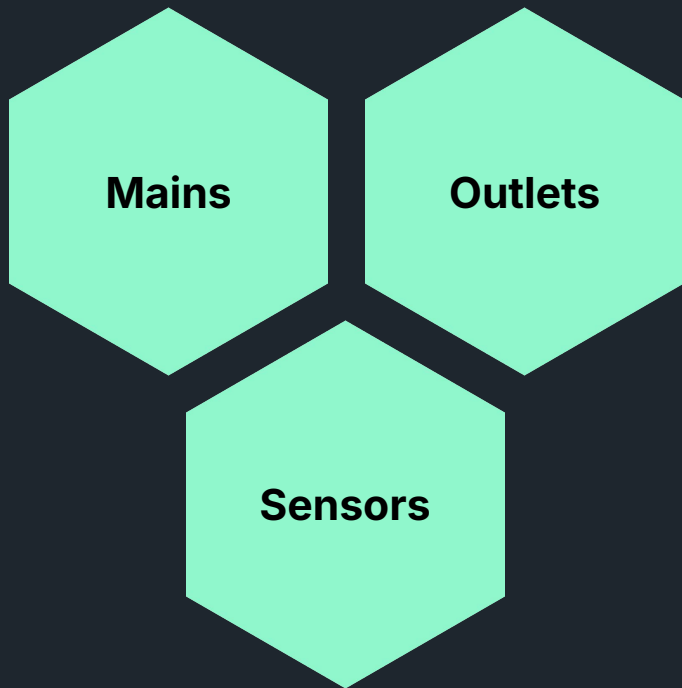
or what can the agent do



Server Monitoring

Most relevant informations from classic servers.

Current state of PDU monitoring



PDU Monitoring

Possible to extend as the standard definition provides some more data.

Checks are based on Redfish v1.16 device data.

The agent in detail

Agent(s)



Agent

- Normal special agent as any other special agent

Types

- One agent for server and storage devices
- One agent for PDU devices
- (Future) one agent for CDU devices - if Redfish output is available

Config

- Rules to select the fetched information
- At the moment only for server and storage devices

Options page

- Disable sections that cause timing issues or configure cache times for these
- Only predefined section list available
- Possibility in the future to have section list that is discovered before
- Cache time for sections with rollup state can improve the runtime

Redfish Compatible Management Controller

Disabled Sections...

Available

>

<

Selected

Array Controllers

CPU

Drives

Fan and Temperatures

Firmware Versions

Hostbustadapters

HPE - Storagesubsystem

iLO5 - Logical Drives

iLO5 - Physical Drives

Memory Modules

Network Cards

Network Interfaces 1

Network Interfaces 2

Powers Supply

Simple Storage Collection (tbd)

Storage

Volumes

Cached times for single sections

Section Memory

600 s

Minimal configuration

- ⬢ All the sections are disabled
- ⬢ System only fetches the overall state
- ⬢ Shortest possible runtime

✓ Redfish Compatible Management Controller

✗ Disabled Sections...

Available



Selected

Array Controllers
CPUs
Drives
Fan and Temperatures
Firmware Versions
Hostbustadapters
HPE - Storagesubsystem
iLO5 - Logical Drives
iLO5 - Physical Drives
Memory Modules
Network Cards
Network Interfaces 1
Network Interfaces 2
Powers Supply
Simple Storage Collection (tbd)
Storage
Volumes

☐ Cached times for single sections

☐ Advanced - TCP Port number



Services of host DELL_IDRAC7-1

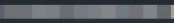
Monitor > Overview > All hosts > DELL_IDRAC7-1 > Services of host

Commands Host Services Export Display Help

Acknowledge problems Schedule downtimes Filter Show checkboxes DELL_IDRAC7-1

5 rows

DELL_IDRAC7-1

State	Service	Icons	Summary	Age	Checked	Perf-O-Meter
OK	Check_MK	 	[special_redfish] Success, [piggyback] Success (but no data found for this host), execution time 0.3 sec	5 m	33.3 s	330 ms
OK	Check_MK Agent		Version: 2.3.0, OS: redfish	2025-04-23 14:47:23	33.3 s	
OK	Check_MK Discovery		Services: all up to date, Host labels: all up to date	2025-04-23 14:47:18	5 m	
OK	Memory Summary		Capacity: 256GB, with State: Component State: Normal, Rollup State: Normal, This resource is enabled.	2025-04-23 14:47:23	33.3 s	
OK	System state		System with SerialNr:  , has State: Component State: Normal, Rollup State: Normal, This resource is enabled.	2025-04-23 14:47:23	33.3 s	

Result of minimal config:

- Very short overview of the system state
- No detailed information in case of failure



Services of host DELL_IDRAC7-1

Monitor > Overview > All hosts > DELL_IDRAC7-1 > Services of host

Commands Host Services Export Display Help

Acknowledge problems Schedule downtimes Filter Show checkboxes DELL_IDRAC7-1

69 rows

DELL_IDRAC7-1

State	Service	Icons	Summary	Age	Checked	Perf-O-Meter
OK	Check_MK		[special_redfish] Success, [piggyback] Success (but no data found for this host), execution time 0.5 sec	9 m	814 ms	480 ms
OK	Check_MK Agent		Version: 2.3.0, OS: redfish	2025-04-23 14:47:23	815 ms	
OK	Check_MK Discovery		Services: all up to date, Host labels: all up to date	32.8 s	32.8 s	
OK	CPU CPU.Socket.1		Type: CPU, Model: Intel(R) Xeon(R) Gold 6438N, Cores: 32, Threads: 64, Speed 2000 MHz	817 ms	817 ms	
OK	CPU CPU.Socket.2		Type: CPU, Model: Intel(R) Xeon(R) Gold 6438N, Cores: 32, Threads: 64, Speed 2000 MHz	817 ms	817 ms	
OK	Drive Disk.Bay.0:Enclosure.Internal.0-0:RAID.Slot.3-1-Physical Disk 0:0:0		Size: 1117GB, Speed 12 Gbs	819 ms	819 ms	
OK	Drive Disk.Bay.0:Enclosure.Internal.0-1:RAID.Slot.3-1-Physical Disk 0:1:0		Size: 18626GB, Speed 6 Gbs	819 ms	819 ms	
OK	Drive Disk.Bay.1:Enclosure.Internal.0-0:RAID.Slot.3-1-Physical Disk 0:0:1		Size: 1117GB, Speed 12 Gbs	820 ms	820 ms	
OK	Drive Disk.Bay.1:Enclosure.Internal.0-1:RAID.Slot.3-1-Physical Disk 0:1:1		Size: 18626GB, Speed 6 Gbs	821 ms	821 ms	
				821 ms	821 ms	
				822 ms	822 ms	
				822 ms	823 ms	
				823 ms	823 ms	
				824 ms	824 ms	
OK	Drive Disk.Bay.7:Enclosure.Internal.0-1:RAID.Slot.3-1-Physical Disk 0:1:7		Size: 18626GB, Speed 6 Gbs	824 ms	824 ms	
	Drive Disk.Bay.8:Enclosure.Internal.0-					

Same system with all sections active:

- Detail information
- Over 60 services

PDU agent

- ❖ No section config
- ❖ Only timing settings
- ❖ But discovery options for the outlet names
- ❖ If the selection of section comes active also the PDU provides a overall system state

Add rule: Redfish outlet discovery

Setup > Services > Service discovery rules > Redfish outlet discovery > Add rule: R

Rule Related Display Help ^



Save



Cancel



Redfish outlet discovery

> Rule properties

▼ Redfish outlet discovery

✕ Naming for outlets at discovery

Please choose ▲

Please choose

Port Index

User Label

Port Index with fill

> Conditions

Commands Host Services Export Display Help

Acknowledge problems Schedule downtimes Filter Show checkboxes RARITAN2

Monitor

Customize

Setup

Help

User

Sidebar

OK	Mains I1		Voltage: 231.6 V, Current: 0.0 A, Power: 2.9 W, Apparent Power: 8.4 VA, Energy: 1522099.7 Wh, Frequency: 50.0 hz	2025-04-23 14:47:32	4.01 s	2.93 W
OK	Outlet 1		Voltage: 232.2 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh	2025-04-23 14:47:32	4.02 s	0.00 W
OK	Outlet 2		Voltage: 232.2 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh	2025-04-23 14:47:32	4.02 s	0.00 W
OK	Outlet 3		Voltage: 232.2 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh	2025-04-23 14:47:32	4.02 s	0.00 W
OK	Outlet 4		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 5		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 6		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 165.8 kWh			0.00 W
OK	Outlet 7		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 262.3 kWh			0.00 W
OK	Outlet 8		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 9					0.00 W
OK	Outlet 10					0.00 W
OK	Outlet 11-Server 1 Netzeil 1		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 165.8 kWh	4.04 s	4.04 s	0.00 W
OK	Outlet 12-Server 1 Netzeil 2		Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 262.3 kWh	4.04 s	4.04 s	0.00 W
OK	Outlet 13		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 14		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 15		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 16		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W
OK	Outlet 17-Server 2 Netzeil 1		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 298.7 kWh	4.06 s	4.06 s	0.00 W
OK	Outlet 18-Server 2 Netzeil 2		Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh			0.00 W

Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh

Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 165.8 kWh

Voltage: 232.0 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 262.3 kWh

Voltage: 231.9 V, Current: 0.0 A, Power: 0.0 W, Frequency: 50.0 hz, Energy: 0.0 kWh

PDU example:

- Some outlets with and without labels

Commands Host Services Export Display Help

Acknowledge problems Schedule downtimes Filter Show checkboxes RARITAN1

OK	Mains I1		Voltage: 0.0 V, Current: 0.0 A, Power: 969.7 W, Apparent Power: 1053.4 VA, Energy: 27971634.1 Wh, Frequency: 50.0 hz	2025-04-23 14:48:19	24.5 s	970 W
OK	Outlet 1		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 2		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 3		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 4		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 5		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 6		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 7		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 8		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 9		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 10		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 11		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 12		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 13		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 14		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 15		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 16		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 17		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	
OK	Outlet 18		Everything looks OK - 1 detail available	2025-04-23 14:48:19	24.5 s	

PDU example:

- Short example with only minimal information
- Same manufacturer as before

Checkmk 2.3 vs. 2.4



Special Agent Config

The config layout from the special agent changed significantly as there are some elements inside the config GUI are not available anymore.



Presentation

As the checks use the normal internal check functions for temperature, humidity and voltage, some of the colors are changed with 2.4.

2.3

☐ Enabled Sections... (only use in case of problems)

☒ Disabled Sections...

Available	>	<	Selected
Memory Modules			
Powers Supply			
CPUs			
Fan and Temperatures			
Firmware Versions			
Network Cards			
Network Interfaces 1			
Network Interfaces 2			
Storage			
Array Controllers			
HPE - Storagesubsystem			
Hostbustadapters			
iLO5 - Physical Drives			
iLO5 - Logical Drives			
Drives			
Volumes			
Simple Storage Collection (tbd)			

☒ Cached times for single sections

☒ Section Memory

60 s

☐ Section Power

☐ Section Processors

2.4

☒ Fetching setting for individual sections

Memory Modules

Cache this section ▾

0

hours

0

mins

Powers Supply

Never ▾

CPUs

Always ▾

Fan and Temperatures

Always ▾

Firmware Versions

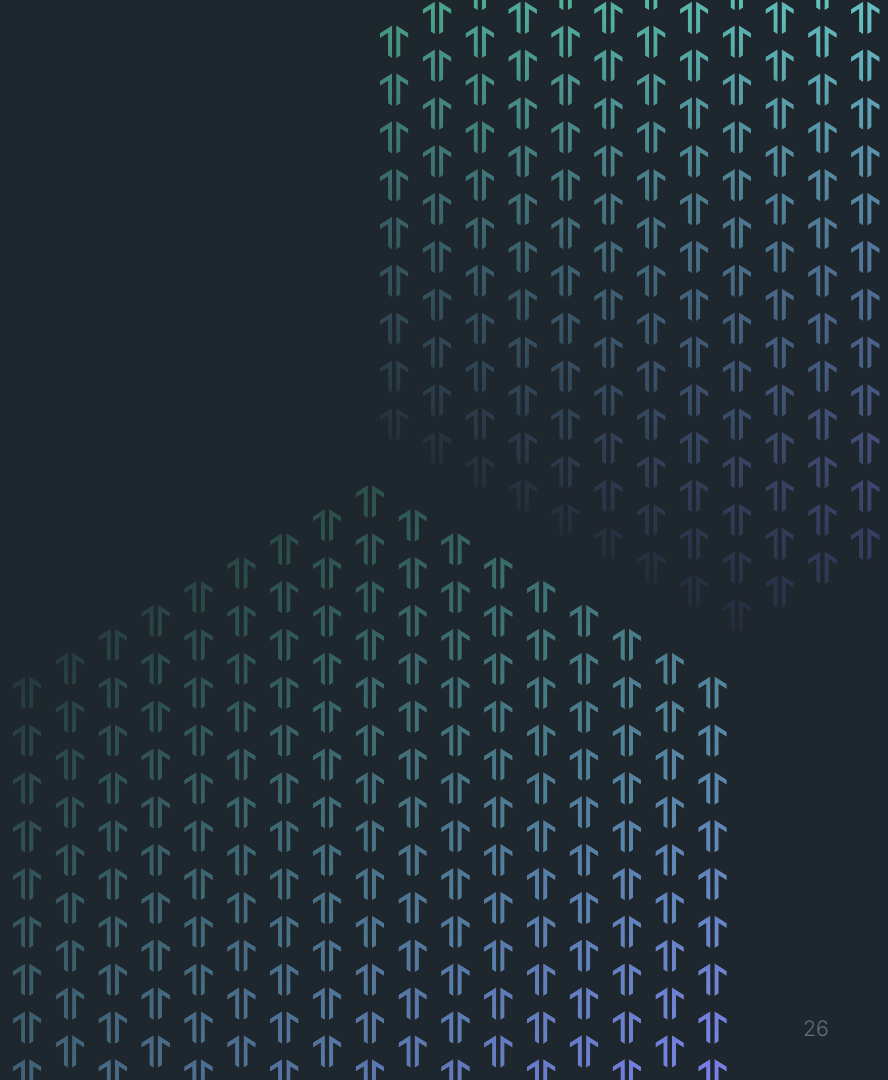
Always ▾

Network Cards

Always ▾

Network Interfaces 1

The Future



Main Goals



HW/SW inventory



Discovery mode for the agent



Telemetry support

HW/SW inventory



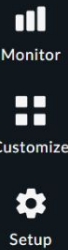
Current state

Only firmware inventory is done.



Future state

Add found hardware components and serial numbers to the Hardware section of the inventory data, like it is done with network devices.



Inventory of host HPE_ILO5-304

Monitor > Overview > All hosts > HPE_ILO5-304 > Services of host > Inventory of host HPE_ILO5-304

Commands Host Export Display Help

Acknowledge problems Schedule downtimes Filter Show checkboxes Services of host

1 row

Host name	HPE_ILO5-304			
	Hardware Firmware Redfish			
Inventory tree	Component	Version	Description	Update possible
	01-iLO 5	3.04 Apr 17 2024	SystemBMC	Yes
	02-System ROM	U32 v2.14 (09/05/2019)	SystemRomActive	Yes
	03-Intelligent Platform Abstraction Data	9.6.0 Build 15	PlatformDefinitionTable	Yes
	04-System Programmable Logic Device	0x2E	SystemProgrammableLogicDevice	Yes
	05-Power Management Controller Firmware	1.0.7	PowerManagementController	Yes
	06-Power Supply Firmware	1.00	PowerSupplies	Yes
	07-Power Supply Firmware	1.00	PowerSupplies	Yes
	08-Innovation Engine (IE) Firmware	0.2.1.2	InnovationEngineFirmware	Yes
	09-Server Platform Services (SPS) Firmware	4.1.4.296	SPSFirmwareVersionData	Yes
	10-Server Platform Services (SPS) Descriptor	1.2 0	SPSFirmwareDescriptor	Yes
	11-Redundant System ROM	U32 v2.14 (09/05/2019)	SystemRomBackup	Yes
	12-Intelligent Provisioning	3.31.63	Intelligent Provisioning	Yes
	13-Power Management Controller FW Bootloader	1.1	PowerManagementControllerBootloader	Yes
	14-HPE Ethernet 1Gb 4-port 331i Adapter - NIC	20.14.54	14e41657103c22be	No
	15-HP FlexFabric 10Gb 2port 534FLR-SFP+ Adapter	7.17.80	14e4168e103c1930	No
		1.99	9005028f103c0654	No
		2.5	102b0538159000e4	No
		HPG1	MK000480GWSSC	No
		HPG1	MK000480GWSSC	No

HW/SW inventory current state:
Only firmware



checkmk



Monitor



Customize



Setup



Help



User



Sidebar

Inventory of host DELL_IDRAC7-1

Monitor > Overview > All hosts > DELL_IDRAC7-1 > Services of host > Inventory of host DELL_IDRAC7-1

Commands Host Export Display Help ^

Acknowledge problems Schedule downtimes Filter Show checkboxes Services of host

1 row

Host name					
DELL_IDRAC7-1					
> Hardware					
v Redfish					
v V1					
v Chassis					
v System Embedded 1					
v Power					
v Powersupplies					
v 0					
Manufacturer		Model	Name	Part Number	Serial
DELL		PWR SPLY,1400W,RDNT,LTON	PS1 Status	06C11WA03	
v 1					
Manufacturer		Model	Name	Part Number	Serial
DELL		PWR SPLY,1400W,RDNT,LTON	PS2 Status	06C11WA03	
v Systems					
v System Embedded 1					
v Memory					
v Dimm Socket A1					
Manufacturer		Model	Name	Part Number	Serial
Samsung		nothing set	DIMM A1	M321R4GA3BB6-CQKMS	

HW/SW inventory mockup:
All the important hardware components

v Raid Slot 3-1
v Drives
v Disk Bay 0-Enclosure Internal 0-0-Raid Slot 3-1

Why discovery mode?



Walking the complete tree takes time



Granular selection of fetched information



Better understanding of the relations between the components

Contact & Redfish resources



