Hello Redfish, Goodbye IPMI

The Future of System Management in the Data Center

(or)

Manage Servers using HTTPS, REST, JSON & ODATA

@wefinet – *Werner Fischer, Thomas-Krenn.AG*

OSDC.de
OPEN SOURCE DATA CENTER CONFERENCE
APRIL 26TH - 28TH, 2016 | BERLIN

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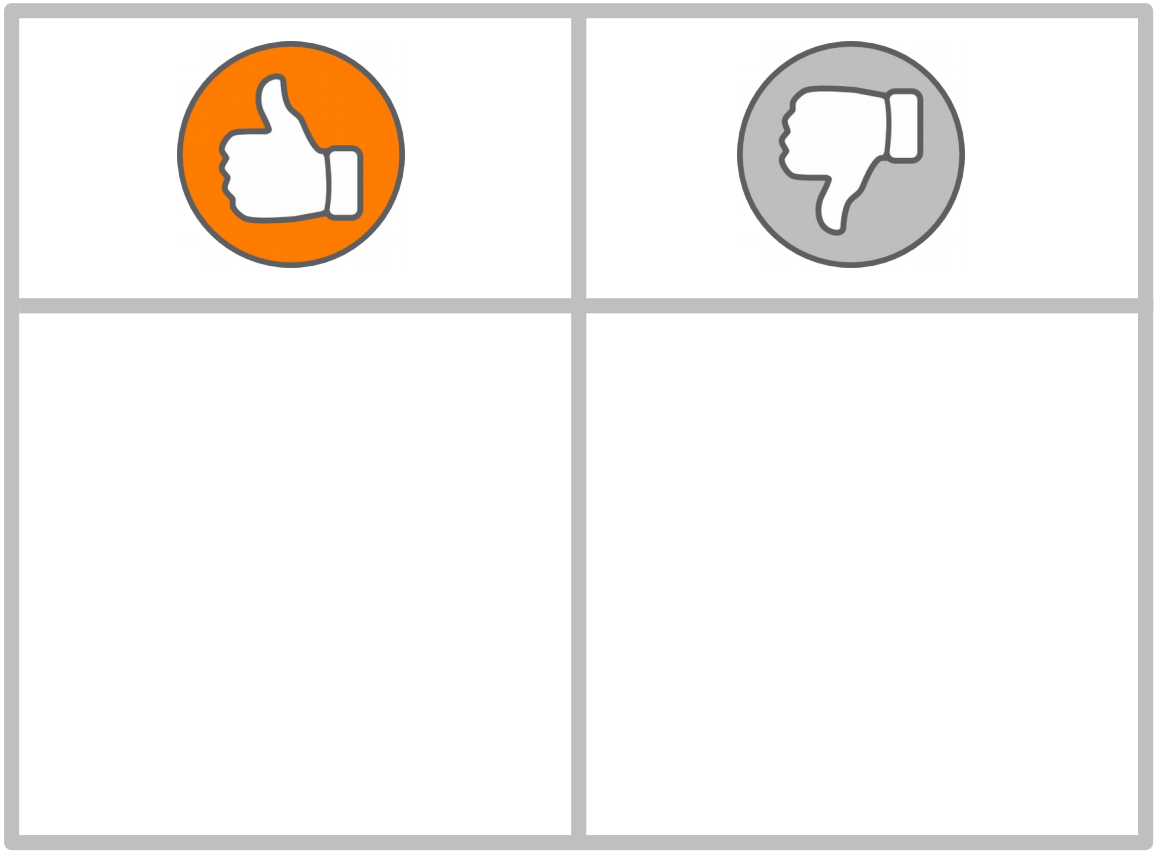
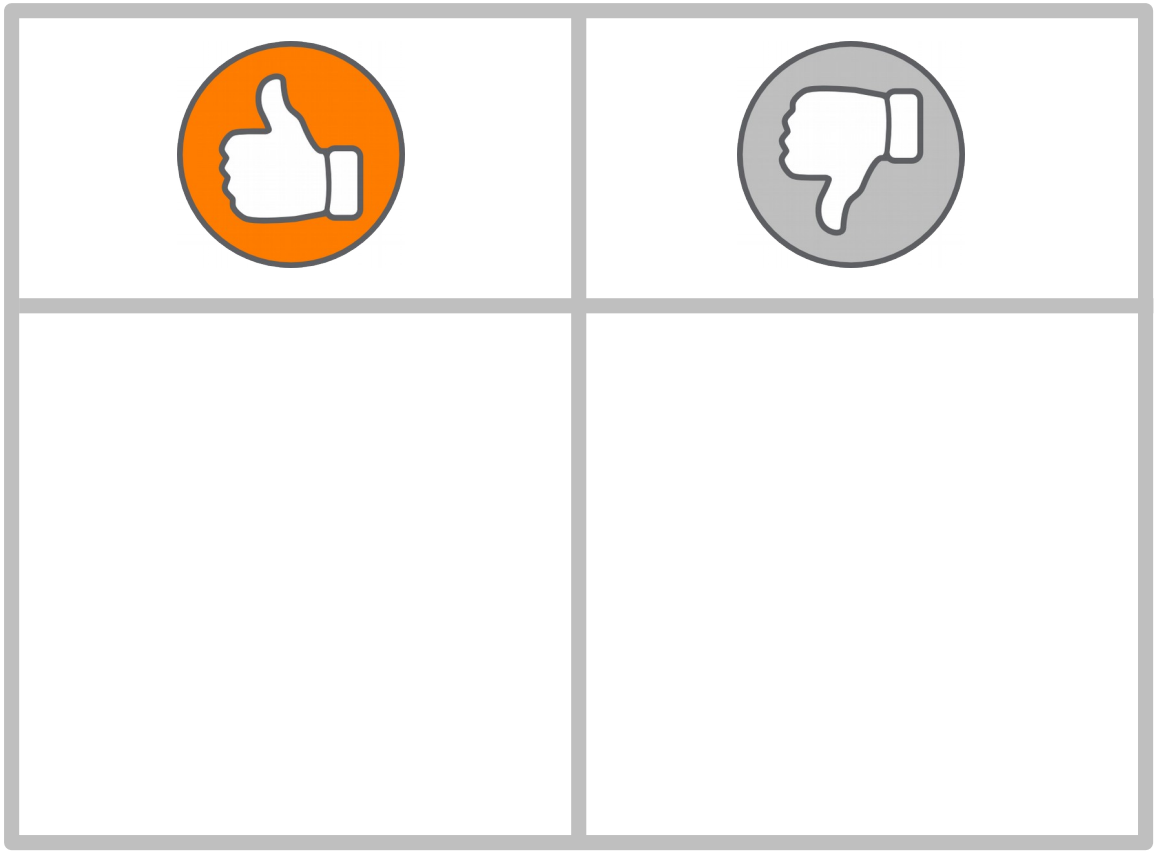
Using Server Remote Management?

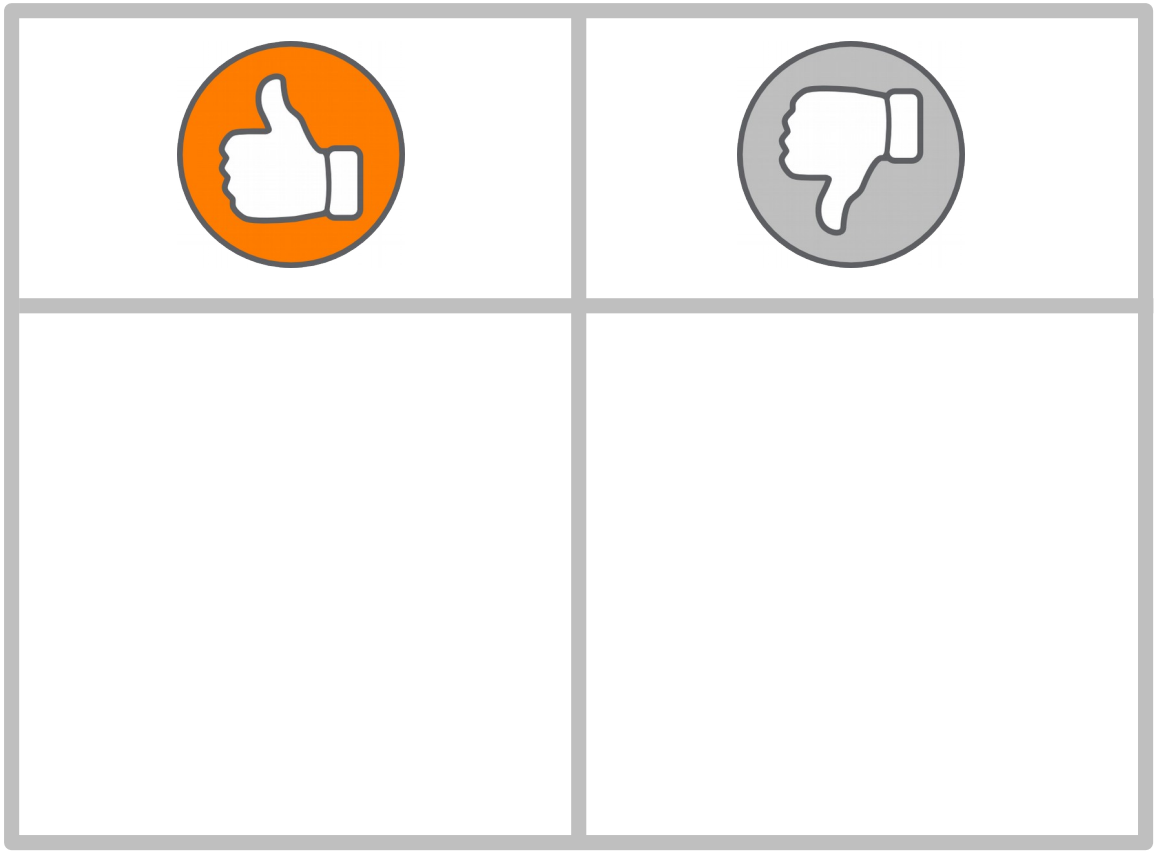
Using Server Remote Management?



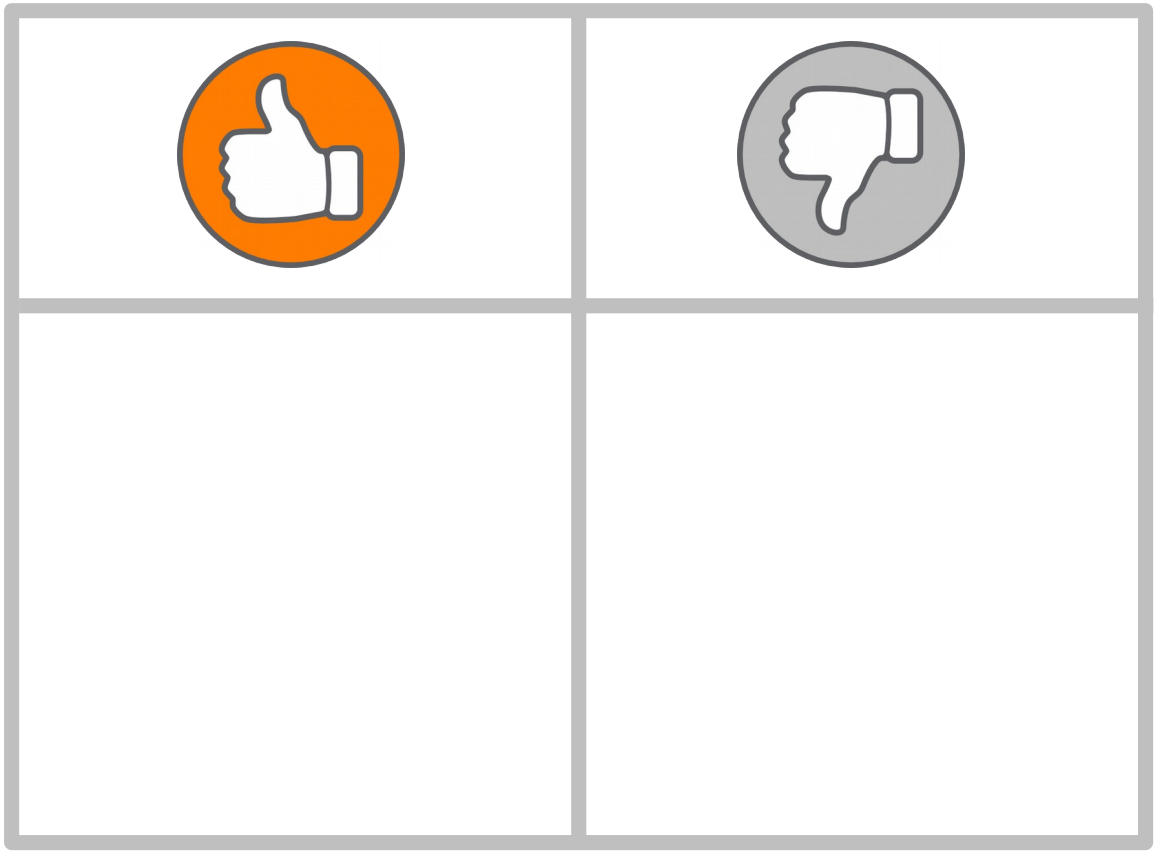
Using ipmitool, freeipmi, ...?



Using Redfish?



Took a Coffee?



Today's Agenda

- Why Remote Management?
- What's already here? (IPMI)
- Why Redfish?
- Data Model
- Operations
- Authentication
- Servers
- Clients
- Python Coding Example
- So what's next?

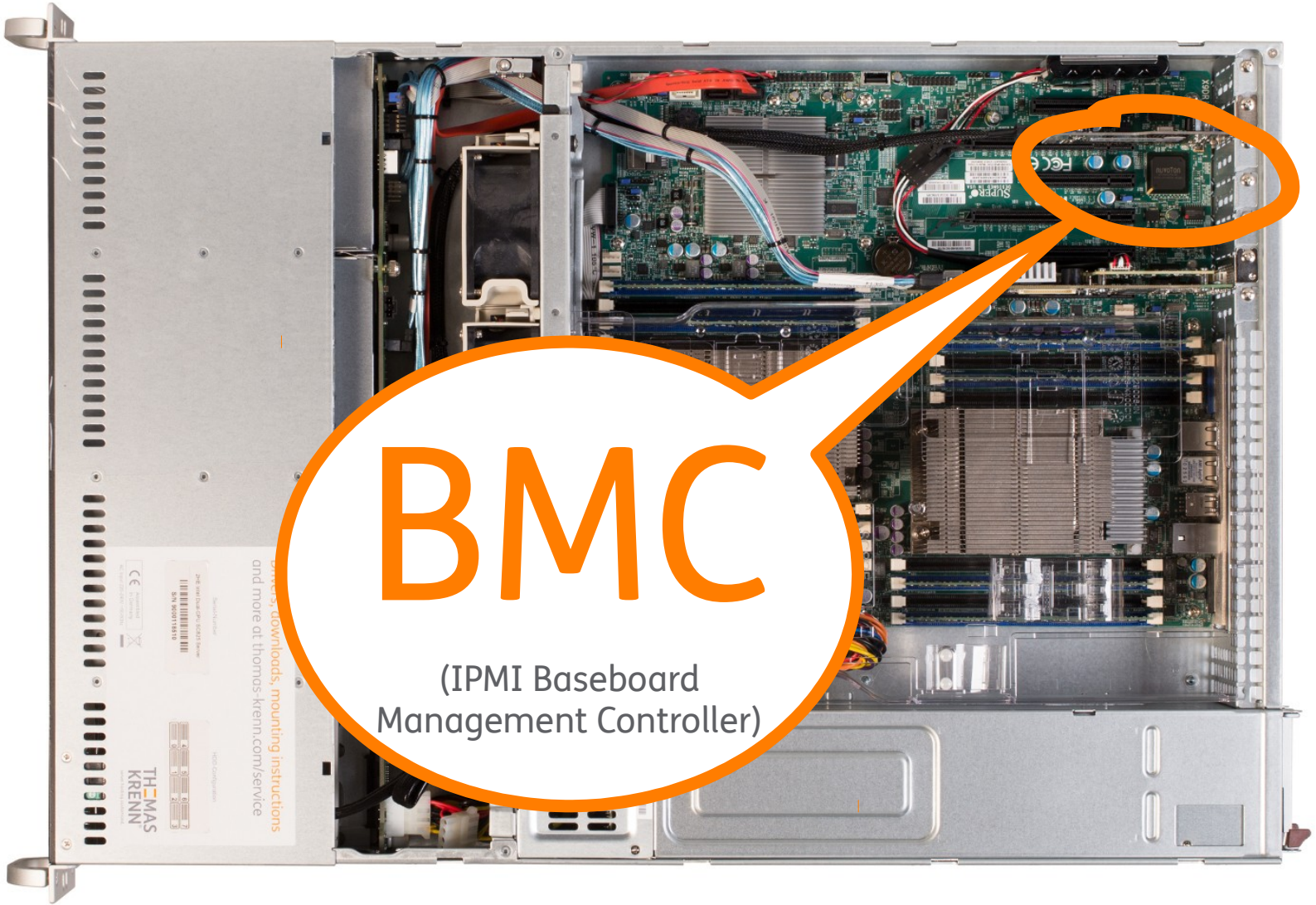
Why Remote Management?


Data Centers:
are cold & loud,
have no daylight
DMTF
Redfish


Sysadmins
want to work
from anywhere
DMTF
Redfish

What's already here?


Drivers, downloads, mounting instructions
and more at thomas-krenn.com/service
THOMAS KRENN
server
RESET


BMC
(IPMI Baseboard
Management Controller)
and more at thomas-krenn.com/service
THOMAS
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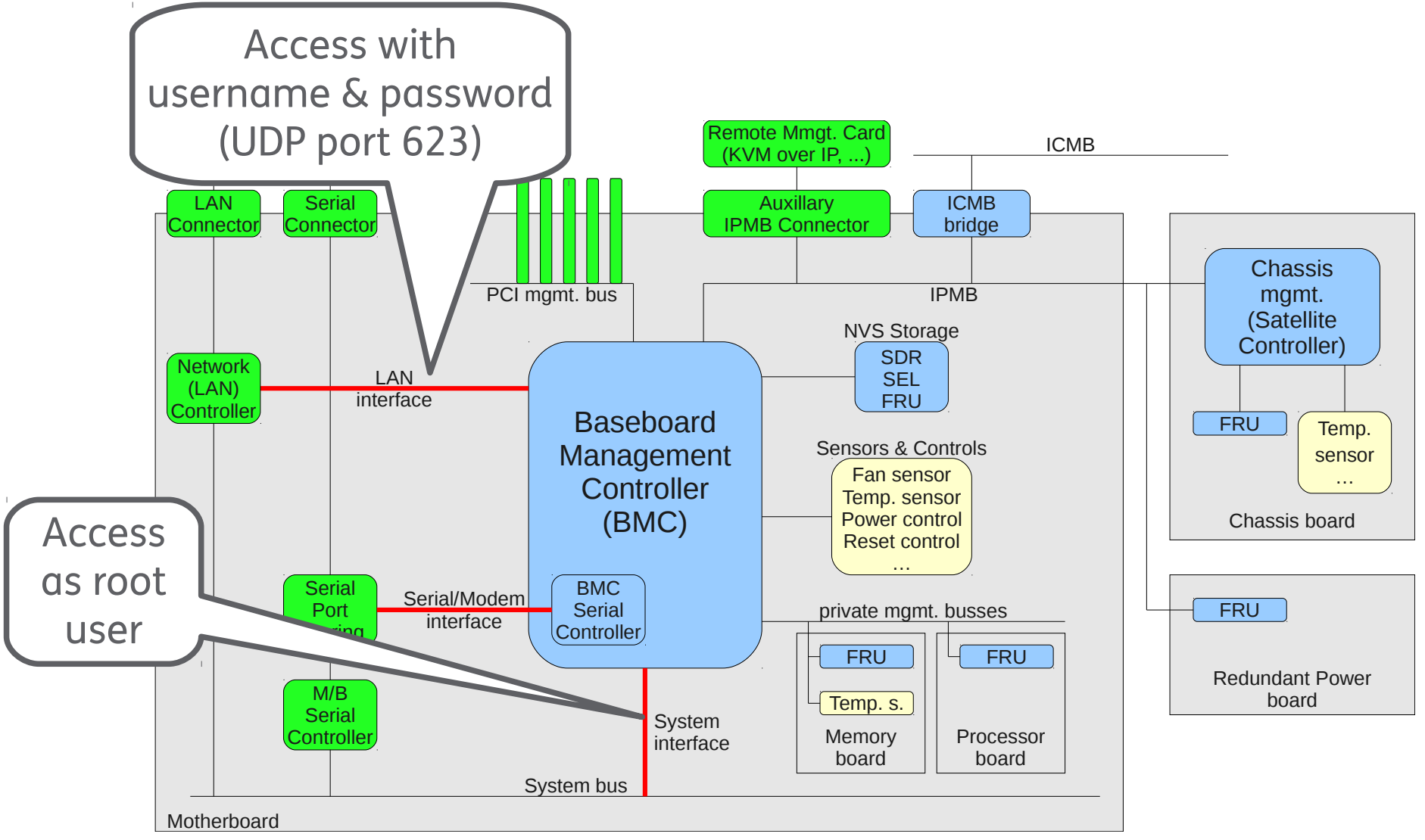
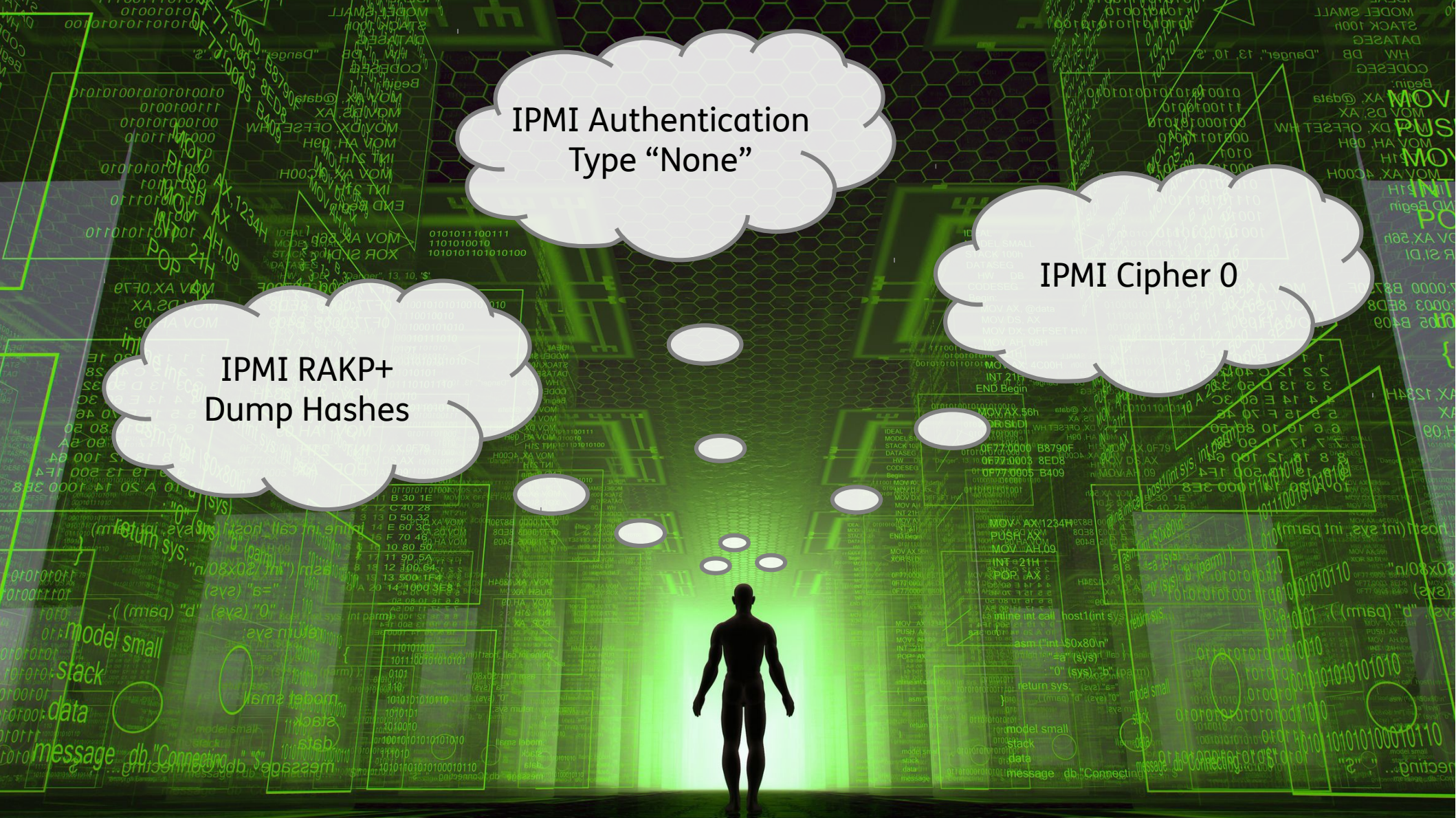

Access with username & password (UDP port 623)
Access as root user
LAN Connector
Serial Connector
Remote Mmgt. Card (KVM over IP, ...)
Auxillary IPMB Connector
ICMB
ICMB bridge
PCI mgmt. bus
IPMB
Chassis mgmt. (Satellite Controller)
FRU
Temp. sensor …
Chassis board
NVS Storage
SDR
SEL
FRU
Network (LAN) Controller
LAN interface
Baseboard Management Controller (BMC)
Sensors & Controls
Fan sensor
Temp. sensor
Power control
Reset control
…
Serial Port
Serial/Modem interface
BMC Serial Controller
private mgmt. busses
FRU
Temp. s.
Memory board
FRU
Processor board
FRU
Redundant Power board
M/B Serial Controller
System interface
System bus
Motherboard


IPMI Authentication
Type “None”
IPMI Cipher 0
IPMI RAKP+
Dump Hashes

mag
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Das Expertenmagazin rund um Server, Storage, Virtualisierung und mehr.

IPMI Sicherheit – Best Practices

VON GEORG SCHÖNBERGER IN WEBINARE — 03.11.2014 UM 10:45

0

Kategorieauswahl

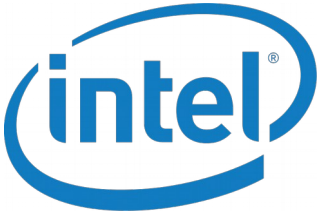
MEHR ZUM THEMA

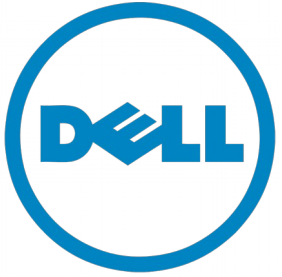
IT-Security Webinare von Thomas-Krenn
Abhörversuche, Datenklau, Industriespionage und Hackerangriffe sind nur einige der möglichen Folgen einer unzureichend gesicherten IT-Infrastruktur. ...read more

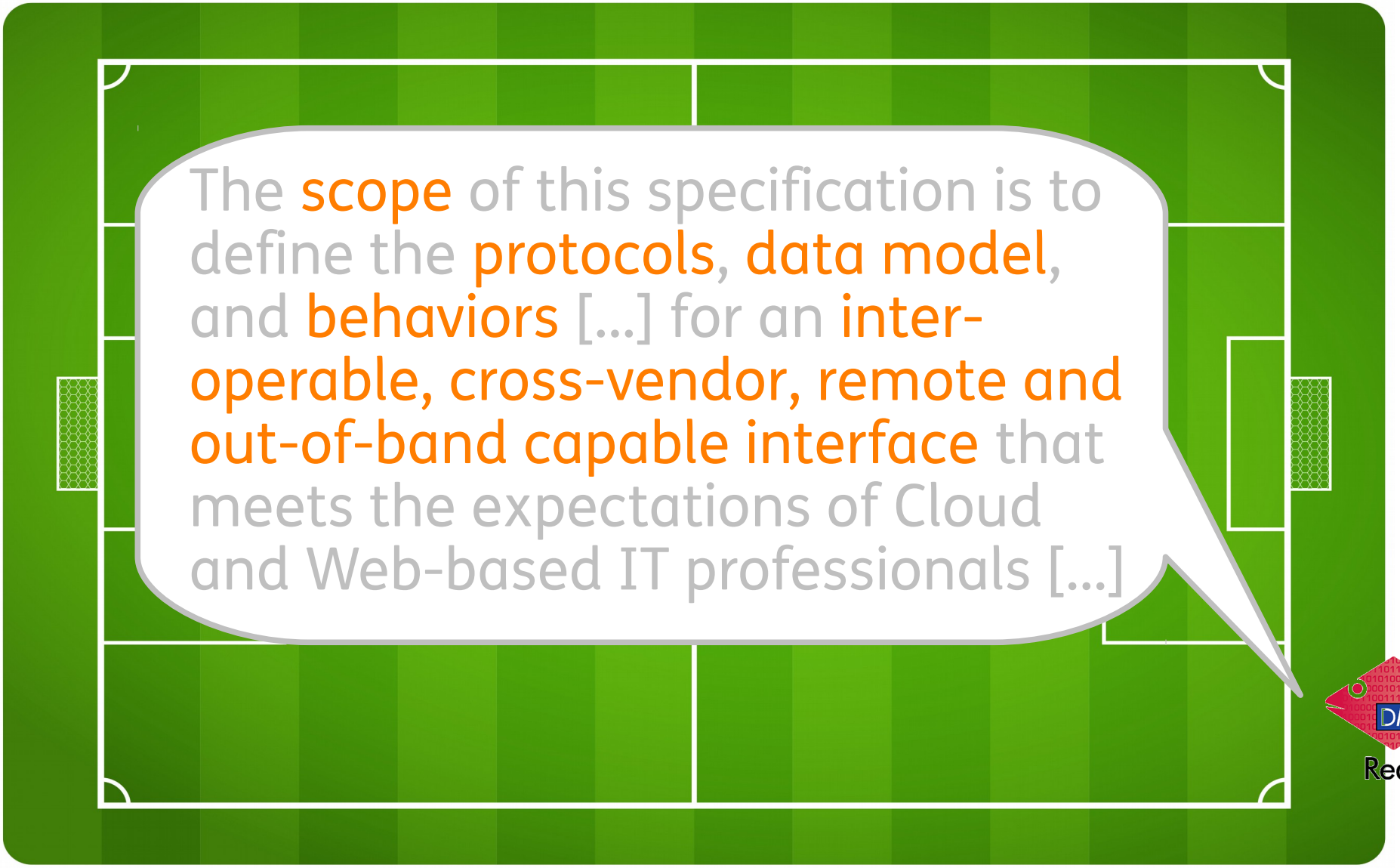
Aufzeichnungen IT-Security-Webinare 2016
Abhörversuche, Datenklau, Industriespionage und Hackerangriffe sind nur einige der schwerwiegenden Folgen einer unzureichend gesicherten IT-Umgebung. ...read more

Why me?
(Why Refish?)

Redfish Initiative started Sep., 2014






The scope of this specification is to define the protocols, data model, and behaviors [...] for an inter-operable, cross-vendor, remote and out-of-band capable interface that meets the expectations of Cloud and Web-based IT professionals [...]
DMTF
Redfish

Goals:

- API for System Management
- Usable by both client applications and browser-based GUIs
- Secure, multi-node capable replacement for IPMI-over-LAN

DMTF

Redfish

Goals (cont.):

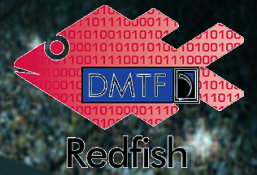
- Schema-backed but human-readable output
- Covers popular use cases
- Intended to meet OCP Open Compute Project Machine Mgmt. requirements

DMTF

Redfish

Design:

- TLS-secured HTTP (HTTPS)
- REST
- JSON
- ODATA / schema-backed data model
  - for developers / users should not need it
  - data model separated from the protocol
- BMC: implementable on existing firmware



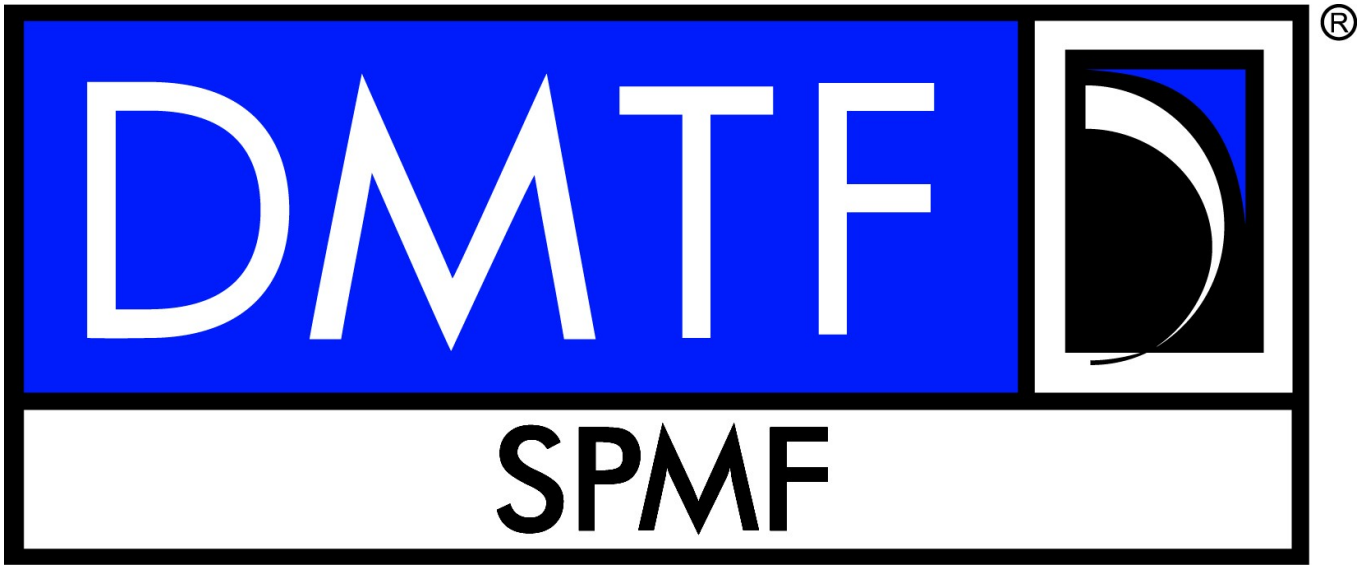
Why DMTF?

(Distributed Management Task Force)

Redfish Initiative → Standard Body: DMTF

Scalable Platforms Management Forum (SPMF)

Currently 12 Promoting Members, 14 Supporting Members



Other DMTF Standards

Open Virtualization Format (OVF)

System Management BIOS (SMBIOS)

Common Interface Model (CIM)

„Openness“ - dmtf.org/join/spmf

	Promoter	Supporter
DMTF Level	min. Leadership $12,000 p.a.	min. Participation $6,000 p.a.
SPMF Level	$25.000 for 1st 2 years, $4,500 p.a.	$4,500 p.a.

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Home › Standards & Technology › REDFISH

Redfish API

REDFISH

Scalability in today's data center is increasingly achieved with horizontal, scale-out solutions, which often include large quantities of simple servers. The usage model of scale-out hardware is drastically different than that of traditional enterprise platforms, and requires a new approach to management.

Designed to meet the expectations of end users for simple, modern and secure management of scalable platform hardware, the DMTF's Redfish is an open industry standard specification and schema that specifies a RESTful interface and utilizes JSON and OData to help customers integrate solutions within their existing tool chains.

Industry feedback has been incorporated into each work-in-progress release and previous versions of the standard have converged into Redfish 1.0.

Click here to read the full Redfish 1.0 release announcement.

The DMTF's SPMF is pleased to introduce the Redfish Resource Explorer!

The Redfish Resource Explorer provides interactive mock-ups of Redfish implementations, showing typical d returned through the API, how that data is organized, and the definition of each property as an easy way to get familiar with the Redfish API. Specific Redfish schema files are also made available for download from the Redfish Schemas Page.

Tutorials and Education

- D2 T1 S6 Managing Servers with Redfish
- Redfish Modeling Guidelines
- Webinar: Redfish Overview
- Webinar: Redfish Data Model Deep Dive
- Presen… …edfish Overview

DMTF Feedback Policy

The DMTF welcomes feedback on our standards, but requires that individuals submitting comments first agree to our DMTF Feedback Policy.

Technology Submission and Feedback Portal

Thank you in advance for your willingness to report an issue or bug in a DMTF specification!

Most issues and bug reports will raise no intellectual property issues at all, but since some may, we need to be sure that our specifications are in compliance with our Patent Policy. Accordingly, we ask that you agree to certain terms that the original submitters of the specification also agreed to.

DMTF CR Tool

In order to facilitate the continued development of the DMTF CIM Schema by our Alliance Partners, the Schema Subcommittee has made the CR tool available for download. The tool will be updated with the latest version of the CIM Schema upon release. Please be sure to use the latest version of the tool when generating CRs against the CIM Schema.

Intellectual Property Rights Agreement

By clicking "Accept" below, you agree that you have read and will abide by the following:

An individual contributor ("Contributor" or "You") submitting a new technical submittal ("Contribution") to the DMTF for consideration to become part of a technical standard must agree to the DMTF Member Policies set forth at www.dmtf.org/about/policies including specifically the Member Rules of Conduct as revised effective May 01, 2009, with its provisions for DMTF ownership of all contributed IP.

You must disclose to the DMTF Technical Committee your personal knowledge or awareness of any patent which could be infringed by an implementation of your Contribution.

Neither you as the individual Contributor nor your company or organization shall be required to conduct a patent search with respect to the Contribution. If you do not have first hand knowledge of any patent which would be infringed upon by an implementation of your contribution, you are encouraged but not required to include a

DMTF Feedback Policy

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but at least you can download the standard, mockup, schemas, free of charge and build OSS on it ;-)

Data Model

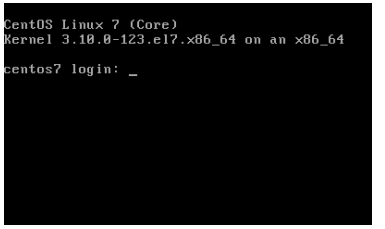
Collections

/redfish/v1

Root + Version

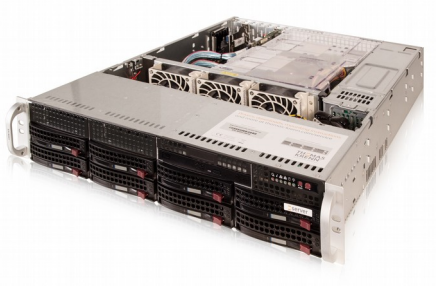
/redfish/v1/Systems

“Logical” view



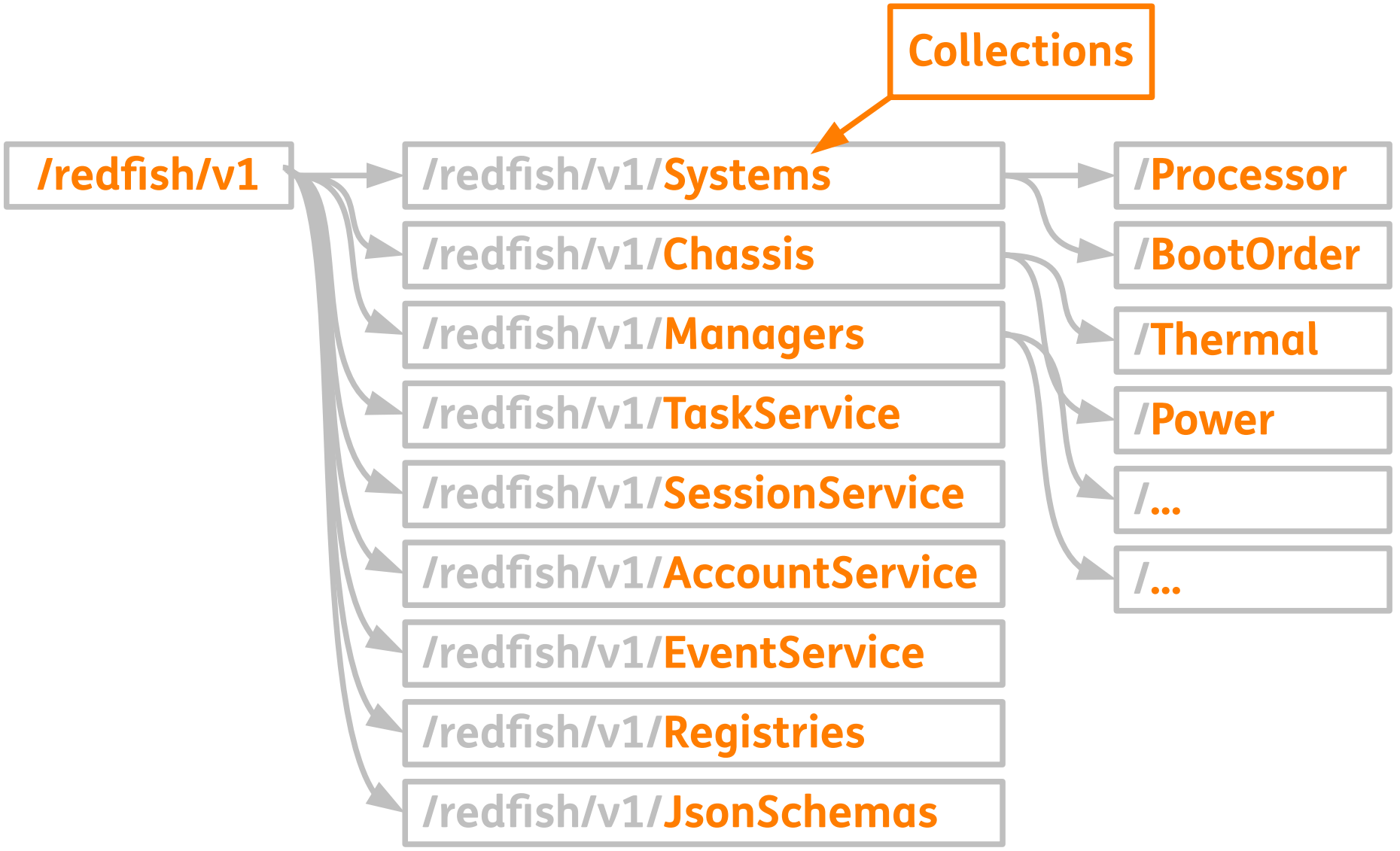
/redfish/v1/Chassis

“Physical” view

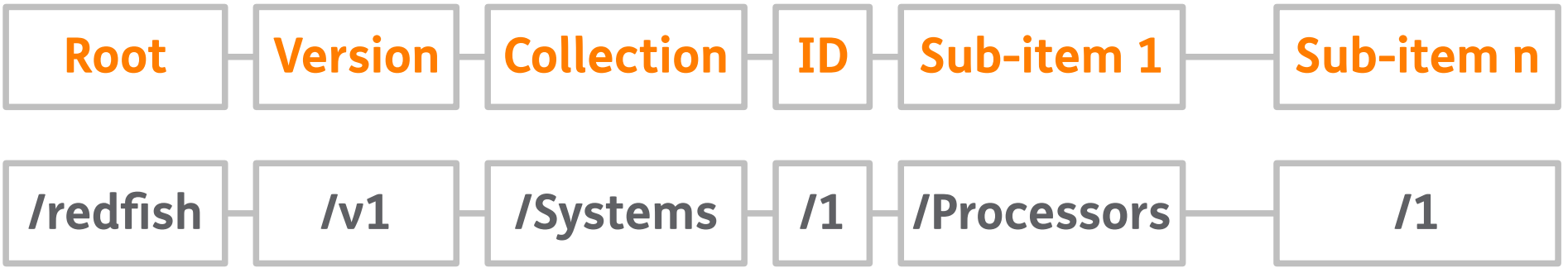


/redfish/v1/Managers

BMC functionality


Collections
/redfish/v1
/redfish/v1/Systems
/redfish/v1/Chassis
/redfish/v1/Managers
/redfish/v1/TaskService
/redfish/v1/SessionService
/redfish/v1/AccountService
/redfish/v1/EventService
/redfish/v1/Registries
/redfish/v1/JsonSchemas
/Processor
/BootOrder
/Thermal
/Power
/...
/...

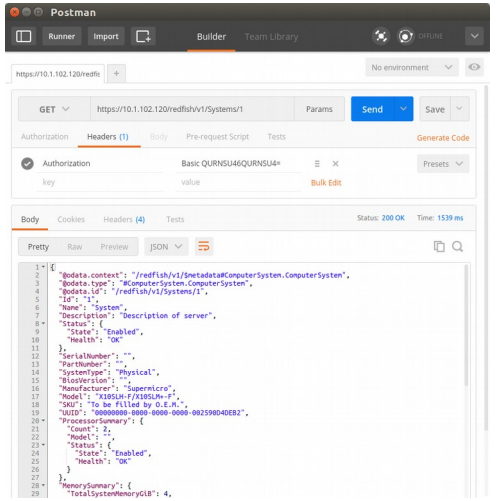
https://<BMC-IP>/redfish/v1/Systems/1/Processors/1



Operations

Redfish Client

Managed Servers



GET https://<BMC-IP>/redfish/v1/...

JSON Response

POST https://<BMC-IP>/redfish/v1/...

JSON Response

Redfish Operations - CRUD

	Create	POST	Create a resource / Use actions
	Read	GET	View data
	Update	PATCH	Change properties of a res.
		PUT	Replace a res.
	Delete	DELETE	Remove a res.

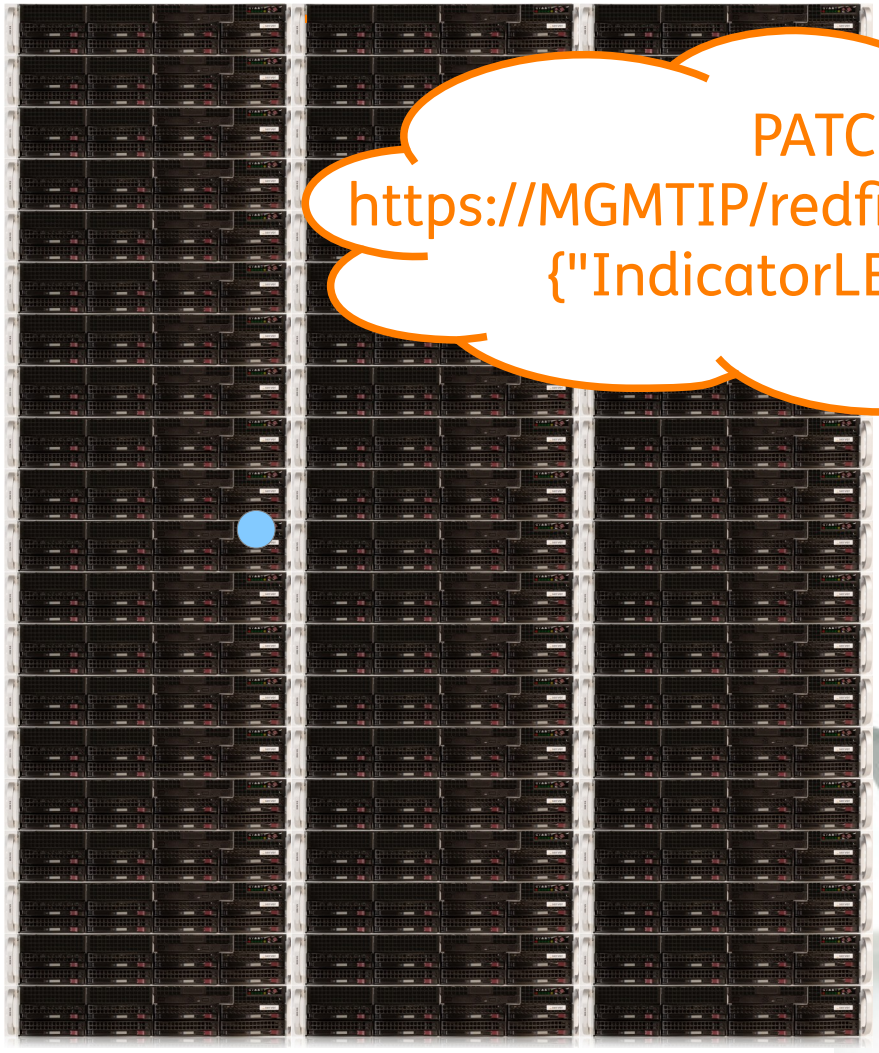
GET https://<BMC-IP>/redfish/v1


```
{
  "@odata.context": "/redfish/v1/$metadata#ServiceRoot.ServiceRoot",
  "@odata.type": "#ServiceRoot.ServiceRoot",
  "@odata.id": "/redfish/v1",
  "Id": "RootService",
  "Name": "Root Service",
  "RedfishVersion": "1.0.1",
  "UUID": "00000000-0000-0000-0000-002590D4DD70",
  "Systems":         {  "@odata.id": "/redfish/v1/Systems"  },
  "Chassis":         {  "@odata.id": "/redfish/v1/Chassis"  },
  "Managers":        {  "@odata.id": "/redfish/v1/Managers"  },
  "SessionService": {  "@odata.id": "/redfish/v1/SessionService"  },
  "AccountService": {  "@odata.id": "/redfish/v1/AccountService"  },
  "EventService":    {  "@odata.id": "/redfish/v1/EventService"  },
  "Registries":      {  "@odata.id": "/redfish/v1/Registries"  },
  "JsonSchemas":     {  "@odata.id": "/redfish/v1/JsonSchemas"  },
  "Links":           {  "Sessions": {"@odata.id": "/redfish/v1/SessionService/Sessions"}},
  "Oem":             {}
}
```

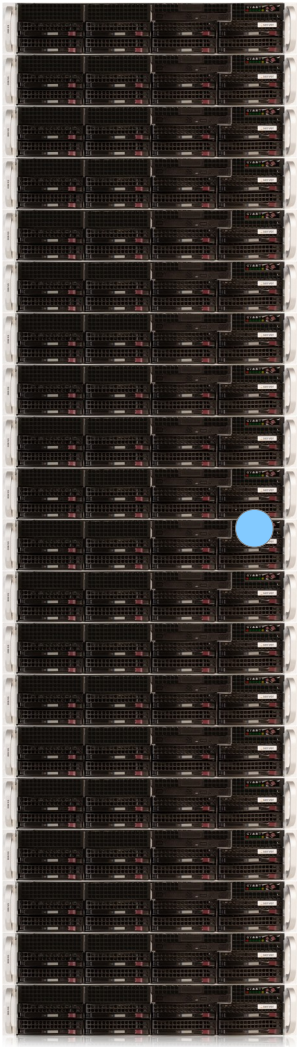
GET https://<BMC-IP>/redfish/v1/systems/1


```
{
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.type": "#ComputerSystem.ComputerSystem",
  "@odata.id": "/redfish/v1/Systems/1",
  "Id": "1",
  "Name": "System",
  "Description": "Description of server",
  "Status": {
    "State": "Enabled",
    "Health": "OK"
  },
  "SerialNumber": "2590D4DEB2",
  "PartNumber": "",
  "SystemType": "Physical",
  "BiosVersion": "3.0",
  "Manufacturer": "Supermicro",
  "Model": "X10SLH-F/X10SLM+-F",
[...]
```


... replace disk #1 of host
srv4711.server-farm.com ...



PATCH
https://MGMTIP/redfish/v1/Systems/1
{"IndicatorLED": "Lit"}



Explore the Resources

Normative requirements On Off Theme Light Dark

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

redfish » v1 » Systems » 437XR1138R2


```
"@Redfish.Copyright": "Copyright © 2014-2015 Distributed
Management Task Force, Inc. (DMTF). All rights reserved.",
"@odata.context": "/redfish/v1/$metadata#Systems/Members
/$entity",
"@odata.id": "/redfish/v1/Systems/437XR1138R2",
"@odata.type": "#ComputerSystem.1.0.0.ComputerSystem",
"Id": "437XR1138R2",
"Name": "WebFrontEnd483",
"SystemType": "Physical",
"AssetTag": "Chicago-45Z-2381",
"Manufacturer": "Contoso",
"Model": "3500RX",
"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"
} ,
"IndicatorLED": "Off",
```


IndicatorLED

The state of the indicator LED, used to identify the system

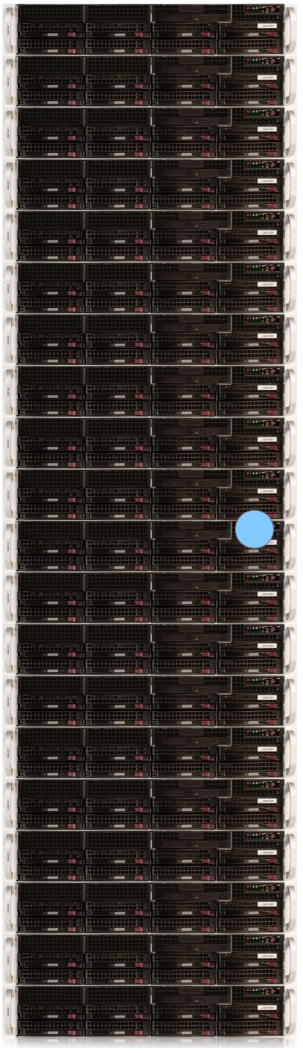
Type: string

Valid values:

`Unknown`	The state of the Indicator LED cannot be determined.
`Lit`	The Indicator LED is lit.
`Blinking`	The Indicator LED is blinking.
`Off`	The Indicator LED is off.

Read/Write


```
"PowerState": "On",
"Boot": {
```



Mozilla Firefox

http://re...ystem.xml

redfish.dmtf.org/schemas/ComputerSystem.xml

Search

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<!--
    Copyright 2014-2015 Distributed Management Task Force, Inc. (DMTF). All rights reserved.
  -->
<edmx:Edmx Version="4.0">
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:Reference Uri="htt
  <edmx:DataServices>
    <!--
        This schema defines a compute
      -->
    <Schema Namespace="(
    <Schema Namespace="(
      <EntityType Name="Co
        <Annotation Term="(
        represents a machine (
        <Annotation Term="(
        Redfish specification."/
      <Property Name="Sy
      <Property Name="Li
      <Property Name="As
      <Property Name="Ma
      <Property Name="Mo
      <Property Name="SK
      <Property Name="Se
      <Property Name="Pa
      <Property Name="UU
      <Property Name="Ho
      <Property Name="Ind
        <Annotation Term=
        <Annotation Term=
        <Annotation Term=
        associated with this s
      </Property>
      <Property Name="Po
```

Mozilla Firefox

http://re...ystem.xml

redfish.dmtf.org/schemas/ComputerSystem.xml

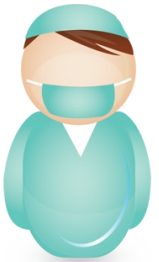
Search

```
        associated with this system."/>
      </Property>
      <Property Name="PowerState" Type="ComputerSystem.1.0.0.PowerState"></Property>
      <Property Name="Boot" Type="ComputerSystem.1.0.0.Boot" Nullable="false"></Property>
      <Property Name="BiosVersion" Type="Edm.String"></Property>
      <Property Name="ProcessorSummary" Type="ComputerSystem.1.0.0.ProcessorSummary" Nullable="false"></Property>
      <Property Name="MemorySummary" Type="ComputerSystem.1.0.0.MemorySummary" Nullable="false"></Property>
      <Property Name="Actions" Type="ComputerSystem.1.0.0.Actions" Nullable="false"></Property>
      <NavigationProperty Name="Processors" Type="ProcessorCollection.ProcessorCollection" ContainsTarget="true"></NavigationProperty>
      <NavigationProperty Name="EthernetInterfaces" Type="EthernetInterfaceCollection.EthernetInterfaceCollection" ContainsTarget="true">
      </NavigationProperty>
      <NavigationProperty Name="SimpleStorage" Type="SimpleStorageCollection.SimpleStorageCollection" ContainsTarget="true">
      </NavigationProperty>
      <NavigationProperty Name="LogServices" Type="LogServiceCollection.LogServiceCollection" ContainsTarget="true"></NavigationProperty>
      <Property Name="Status" Type="Resource.Status"/>
    </EntityType>
    <ComplexType Name="Links" BaseType="Resource.Links"></ComplexType>
    <ComplexType Name="Actions"></ComplexType>
    <ComplexType Name="OemActions"></ComplexType>
    <EnumType Name="SystemType"></EnumType>
    <!-- These are all supported LED statuses. -->
    <EnumType Name="IndicatorLED">
      <Member Name="Unknown">
        <Annotation Term="OData.Description" String="The state of the Indicator LED cannot be determined."/>
      </Member>
      <Member Name="Lit">
        <Annotation Term="OData.Description" String="The Indicator LED is lit."/>
      </Member>
      <Member Name="Blinking">
        <Annotation Term="OData.Description" String="The Indicator LED is blinking."/>
      </Member>
      <Member Name="Off">
        <Annotation Term="OData.Description" String="The Indicator LED is off."/>
      </Member>
    </EnumType>
    <EnumType Name="PowerState"></EnumType>
    <ComplexType Name="Boot"></ComplexType>
    <EnumType Name="BootSource"></EnumType>
    <EnumType Name="BootSourceOverrideEnabled"></EnumType>
    <ComplexType Name="ProcessorSummary"></ComplexType>
    <ComplexType Name="MemorySummary"></ComplexType>
  </Schema>
  <Schema Namespace="ComputerSystem.1.0.1"></Schema>
 </edmx:DataServices>
</edmx:Edmx>
```

Authentication & Roles

Redfish Authentication

- HTTP Basic Auth
  - RFC2617
  - username & password sent with each request
- Session Based Authentication
  - Session login is initiated by accessing the Create session URI
  - Sesponse includes an “X-Auth-Token” header with a session token
  - Session logout is done by issuing a DELETE of the Session resource


Roles →	Administrator	Operator	ReadOnly
Login	x	x	x
ConfigureSelf	x	x	x
ConfigureComponents	x	x	
ConfigureManager	x		
ConfigureUsers	x		

Servers

Thomas-Krenn

based on Supermicro X10
BMC Firmware >= 3.0
OOB License

HPE

based Gen9 with iLO 4
BMC Firmware >= 2.30
check licensing requirements

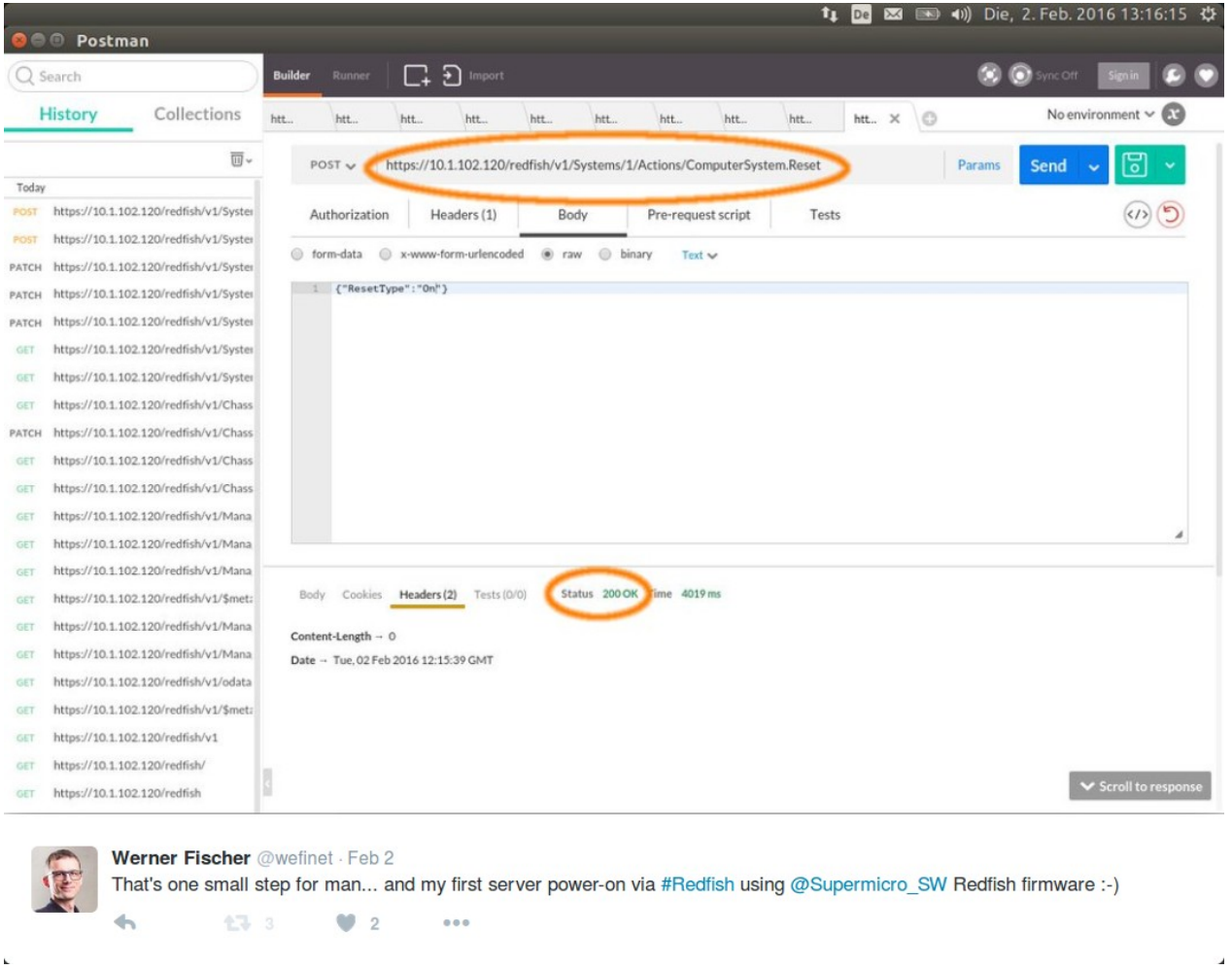
Dell

using iDRAC7 / iDRAC8
BMC Firmware >= 2.30.30.30
check licensing requirements

Clients

Redfish Clients

- Chrome:
  - Postman
  - Advanced REST Client
- Firefox
  - RESTClient
  - REST Easy



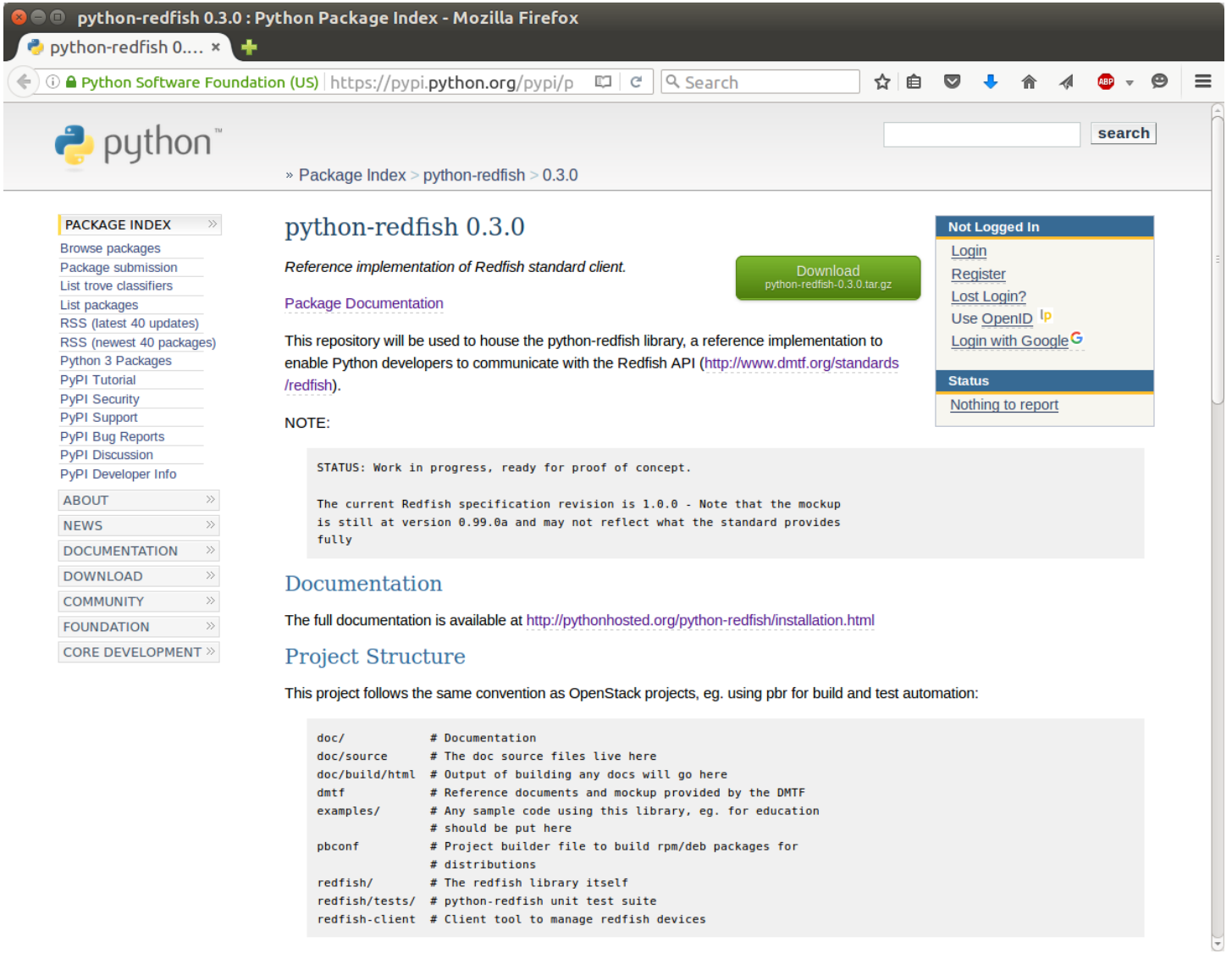
Python Coding Example

redfish-example.py Source

```
import json, requests
url='https://10.1.102.120/redfish/v1/Systems/1'
userid='redfishuser'
password='Lc9AcnLcQq2'
r = requests.get(url, auth=(userid, password), verify=False)
jsonData = r.json()
print "Manufacturer:", (jsonData['Manufacturer'])
print "Model:", (jsonData['Model'])
print "PowerState:", (jsonData['PowerState'])
print "BiosVersion:", (jsonData['BiosVersion'])
print "Description:", (jsonData['Description'])
```

redfish-example.py executed

```
$ python redfish-example.py
Manufacturer: Supermicro
Model: X10SLH-F/X10SLM+-F
PowerState: On
BiosVersion: 3.0
Description: Description of server
```


python-redfish 0.3.0 : Python Package Index - Mozilla Firefox
python-redfish 0.... ×
Python Software Foundation (US) https://pypi.python.org/pypi/p
Search
python
search
» Package Index > python-redfish > 0.3.0
PACKAGE INDEX
Browse packages
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List packages
RSS (latest 40 updates)
RSS (newest 40 packages)
Python 3 Packages
PyPI Tutorial
PyPI Security
PyPI Support
PyPI Bug Reports
PyPI Discussion
PyPI Developer Info
ABOUT
NEWS
DOCUMENTATION
DOWNLOAD
COMMUNITY
FOUNDATION
CORE DEVELOPMENT
python-redfish 0.3.0
Reference implementation of Redfish standard client.
Download
python-redfish-0.3.0.tar.gz
Package Documentation
This repository will be used to house the python-redfish library, a reference implementation to enable Python developers to communicate with the Redfish API (http://www.dmtf.org/standards/redfish).
NOTE:
STATUS: Work in progress, ready for proof of concept.
The current Redfish specification revision is 1.0.0 - Note that the mockup is still at version 0.99.0a and may not reflect what the standard provides fully
Documentation
The full documentation is available at http://pythonhosted.org/python-redfish/installation.html
Project Structure
This project follows the same convention as OpenStack projects, eg. using pbr for build and test automation:
doc/ # Documentation
doc/source # The doc source files live here
doc/build/html # Output of building any docs will go here
dmtf # Reference documents and mockup provided by the DMTF
examples/ # Any sample code using this library, eg. for education
should be put here
pbconf # Project builder file to build rpm/deb packages for
distributions
redfish/ # The redfish library itself
redfish/tests/ # python-redfish unit test suite
redfish-client # Client tool to manage redfish devices
Not Logged In
Login
Register
Lost Login?
Use OpenID
Login with Google
Status
Nothing to report

DMTF

Redfish

Redfish Future Plans

- In-band Redfish from within the OS
- Firmware-update
- Broader storage support
- Security: allow more granularity
- AMI Announces Out-of-Band BIOS Configuration through Redfish

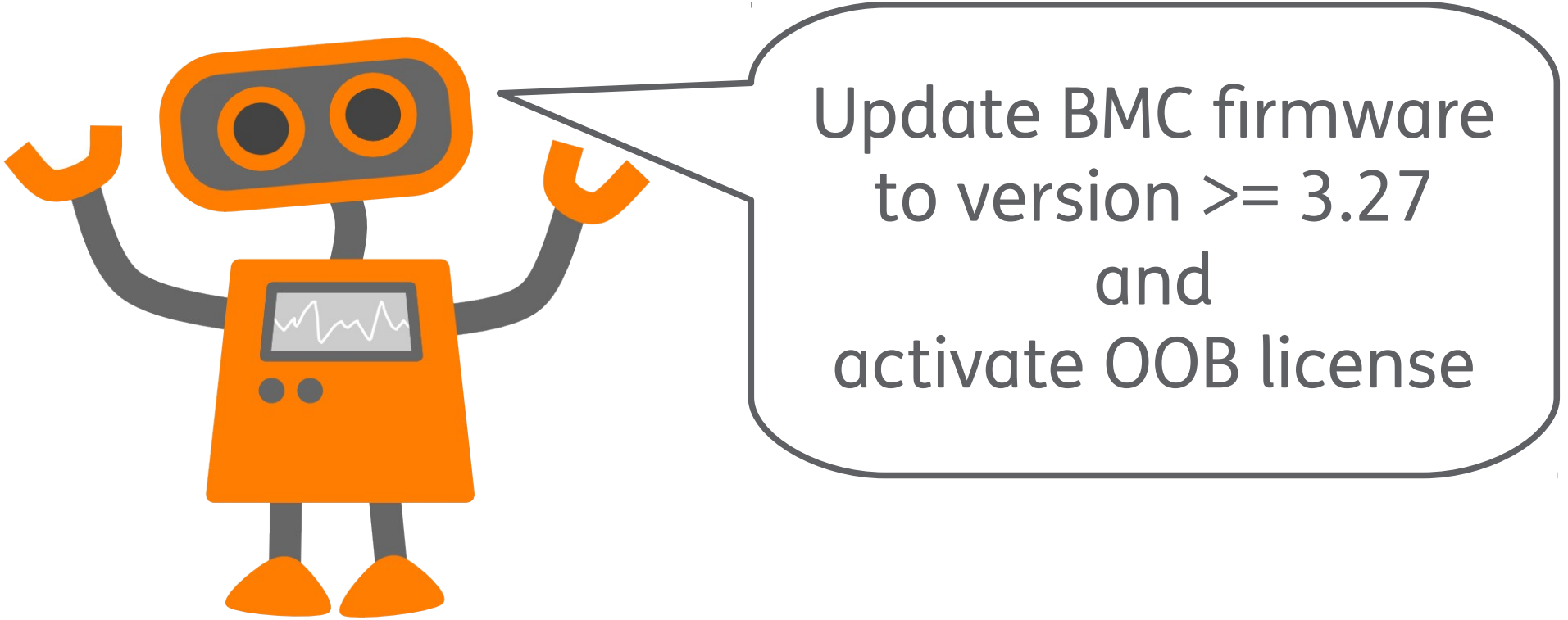
Source: Jeff Autor, SPMF Forum Chair, OCP US Summit 2016
youtube.com/watch?v=qF5XI1geKbQ

So what's next?

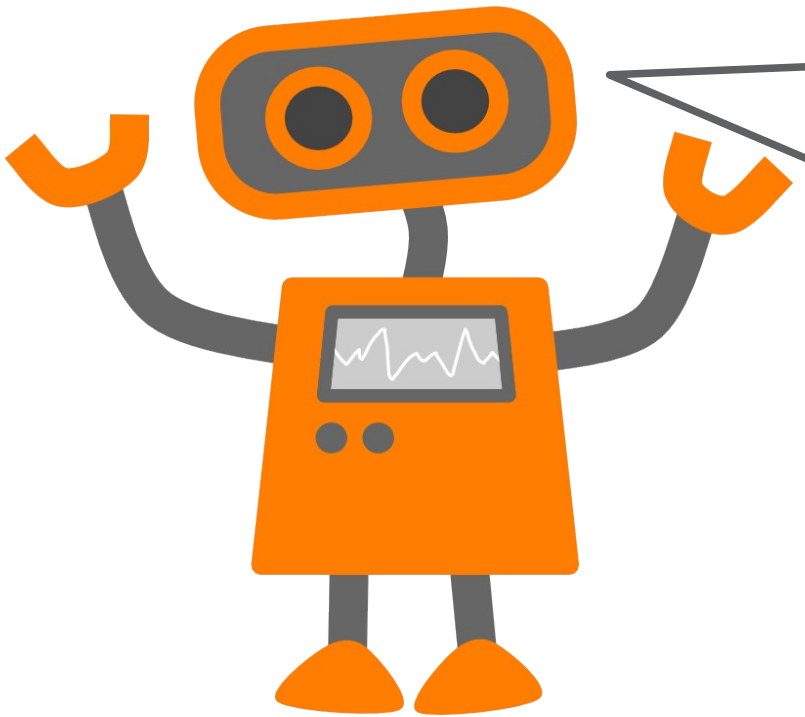

Reach for the Sky

X10-based Thomas-Krenn-Servers?

X10-based Thomas-Krenn-Servers?

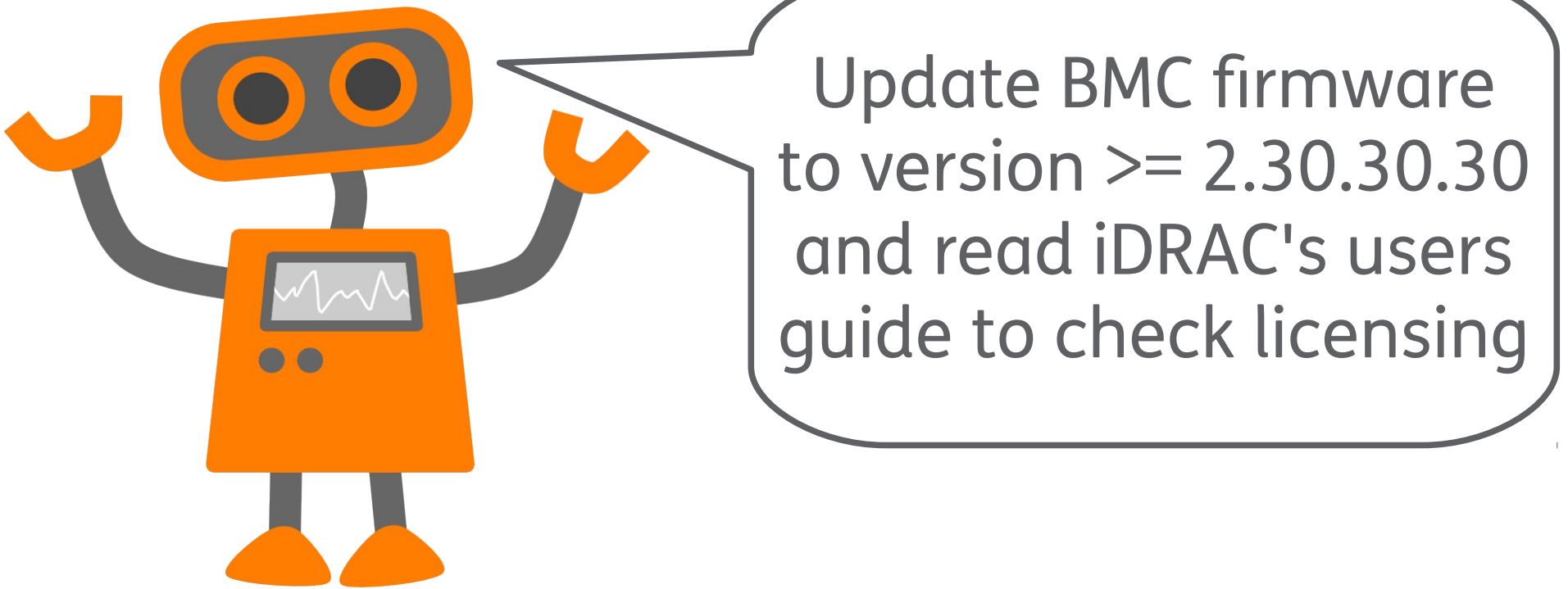


HPE Gen9 Servers with iLO4?

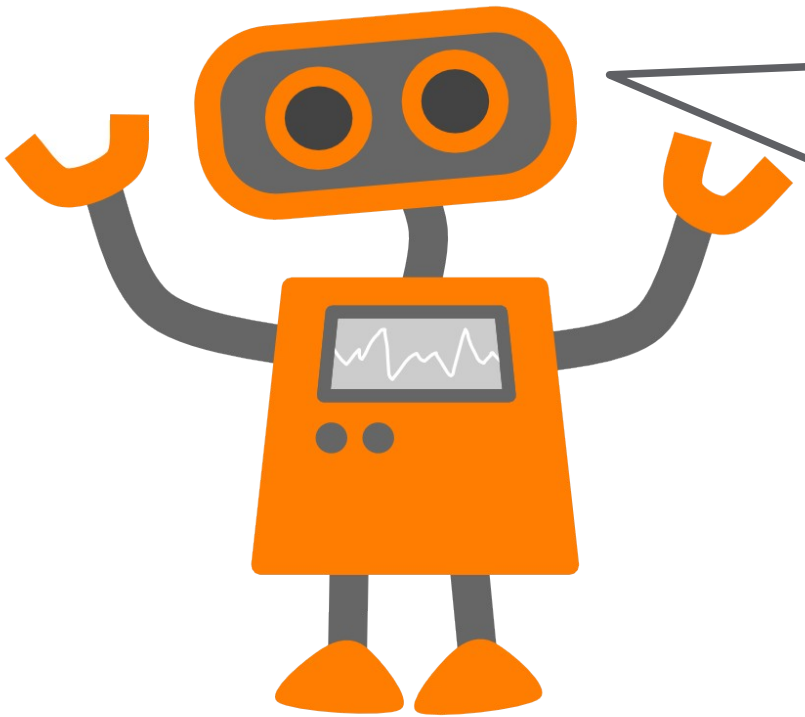


Update BMC firmware to version >= v2.30 and check licensing requirements

Dell Servers with iDRAC7 / iDRAC8?



other Servers?



replace with X10-based Thomas-Krenn-Servers ;-)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