Redfish 낚아채기

Open Infra community Day Korea 2020


엔씨의
인프라 운영도[밤안샜어요]다.
NCSOFT


엘프의 디테일이 변화하는 해마다..
NC가 새로운 기록을 갱신할 때마다
시스템 인프라도 고도화 되어 왔습니다

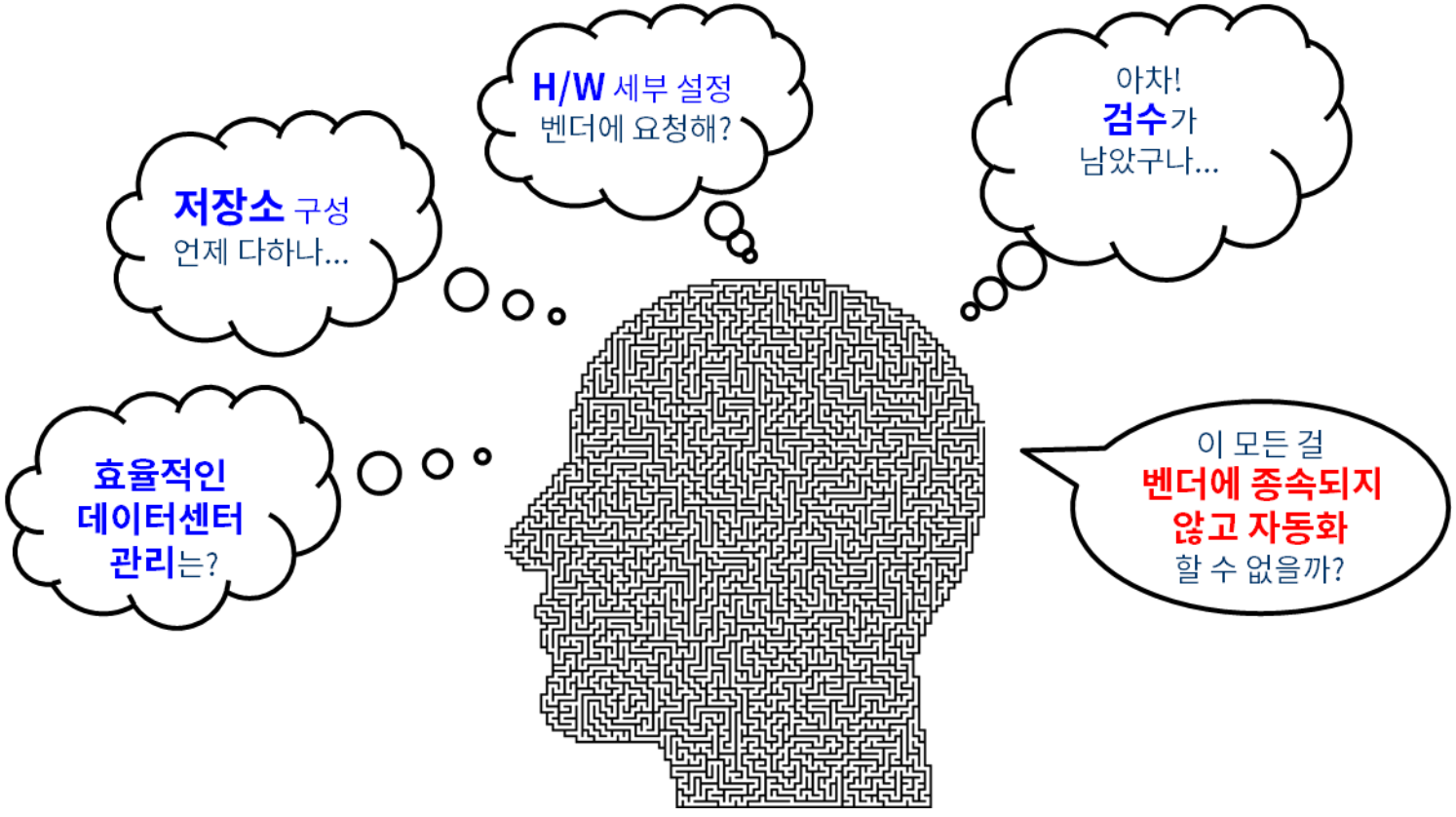

보다 빠른 인프라 딜리버리 방법과..
데이터 센터관리 방향성을
Redfish 를 통해서 설명하려 합니다

:~$ whoami

- NCSoft
- I&O Center
- #Linux #Server #Storage #Infrastructure

- 김현준
- whiteeagle@ncsoft.com

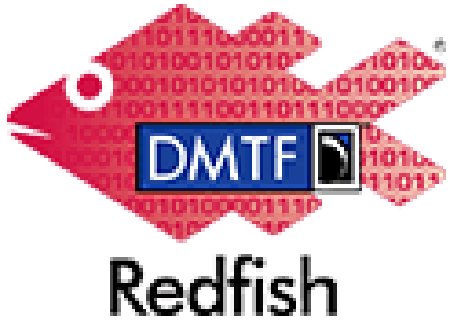
해결책? Redfish!


H/W 세부 설정
벤더에 요청해?
아차!
검수가
남았구나...
저장소 구성
언제 다하나...
효율적인
데이터센터
관리는?
이 모든 걸
벤더에 종속되지
않고 자동화
할 수 없을까?

Useful

- System engineer
- Datacenter administrator
- Infra developer & architect
- KPI

What is Open Fish?



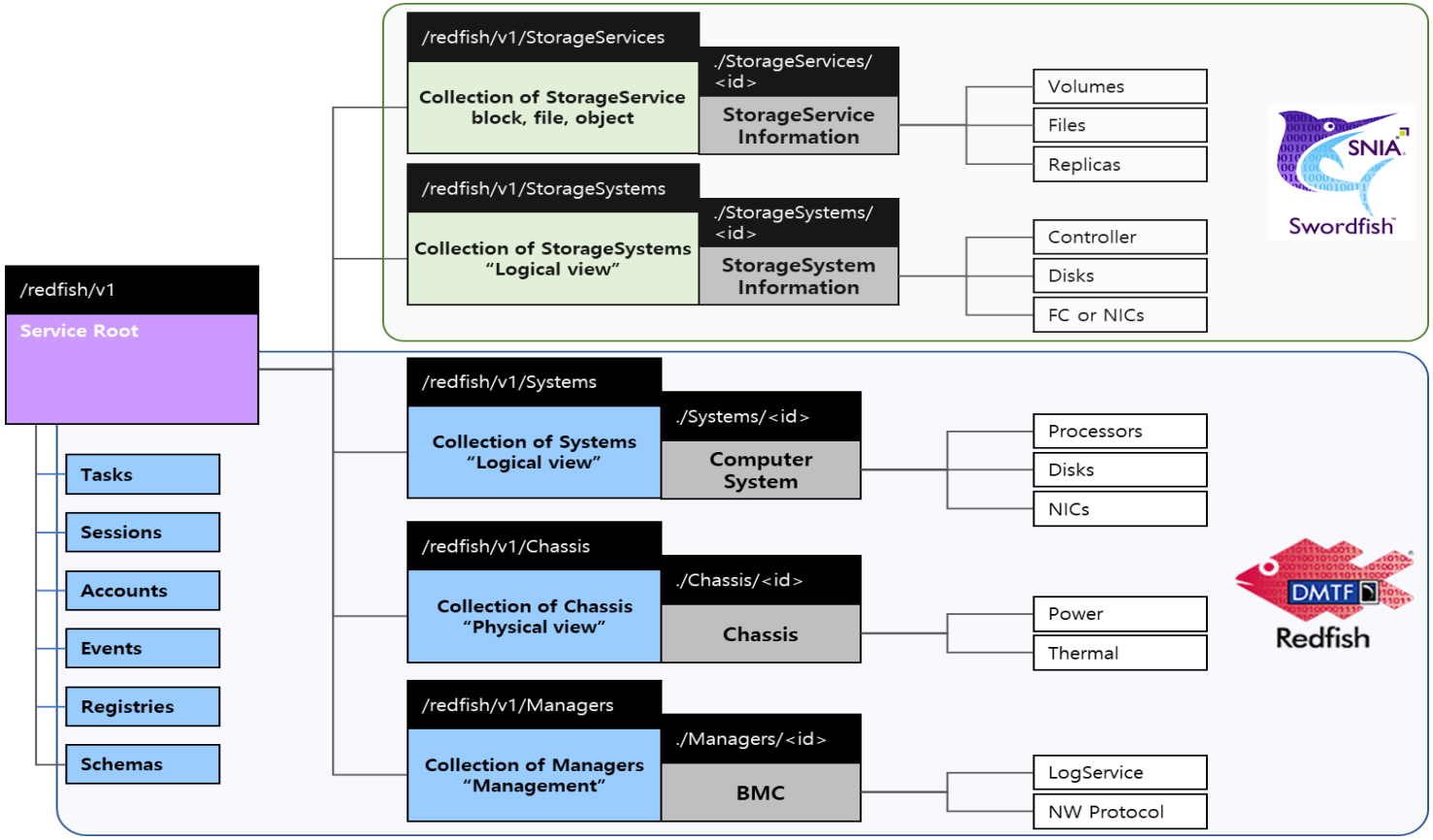
- 1.0 SPEC released Aug. 2015
- Management for server, storage, network
- RESTful interface over HTTPS in JSON format based on ODATA4

- 1.0 SPEC released Sep. 2016
- Scalable Storage Management for storage
- Redfish API의 확장으로 Swordfish 구현

Redfish

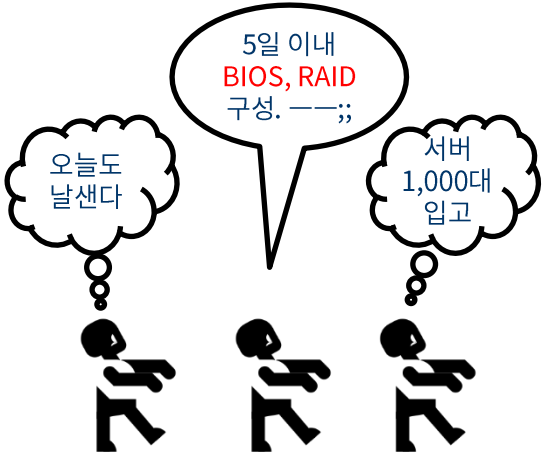
- Integrated OOB(Out-of-band) control
- Enhanced server health status check
- Hardware configuration management
- Access system logs
- Over 70 collection types & 1000 URIs

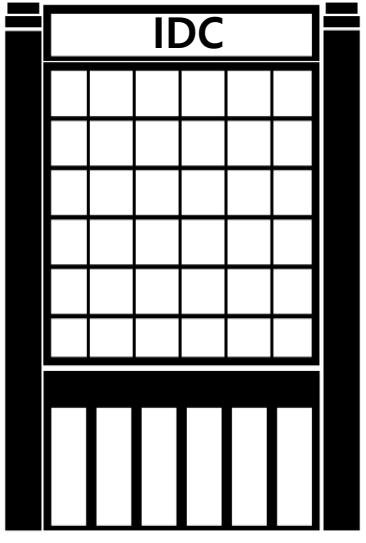
Redfish와 Swordfish 관계



Redfish 적용 Before & After

3명에서 5일간 작업

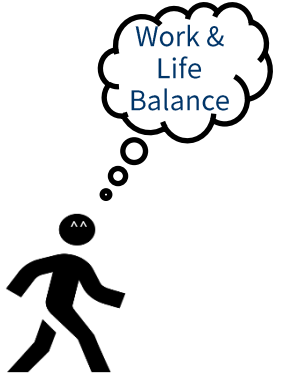




혼자서 10분이면 OK!

```
# time apply_BIOSsettings.sh
applying BIOS Setting... Start
...
...
applying BIOS Setting... End!

real    10m0.085s
#
```



Redfish vs IPMI vs Vendor 플랫폼 비교

구분	Redfish	IPMI	Vendor
Protocol	HTTPS	RMCP, RMCP+	HTTP, HTTPS
BIOS 설정	O	-	o (벤더 종속)
BMC 설정	O	△ (일부 지원)	o (벤더 종속)
RAID 설정	O	-	o (벤더 종속)
모니터링 (전력, 온도)	O	△	o (벤더 종속)
모니터링 (이벤트 로그)	O	△	o (벤더 종속)
Locality Call	△	O	△ (벤더 종속)
자동화 (Script)	O	△	△ (벤더 종속)

Redfish API Tree

Systems Collection

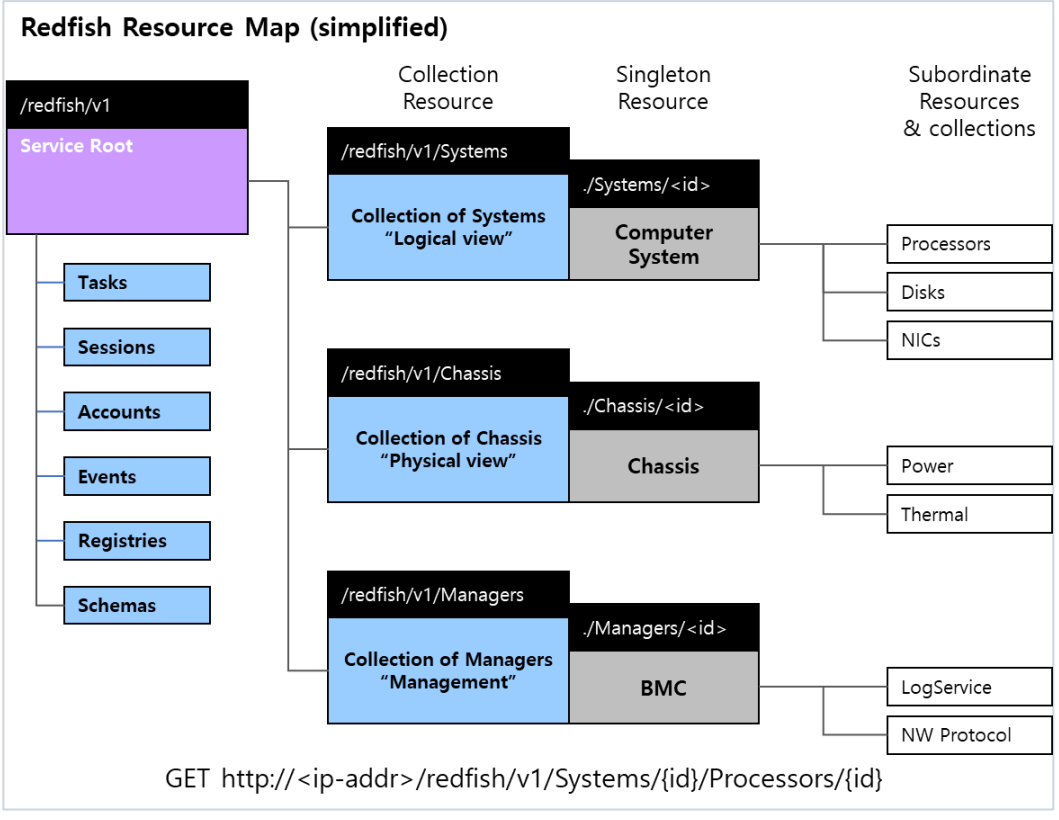
- BIOS 설정 → PATCH /Systems/1/Bios/Settings
- RAID 구성 → PUT /Systems/1/SmartStorageConfig/Settings
- 서버 Reset → POST /Systems/1/Actions/ComputerSystem.Reset

Managers Collection

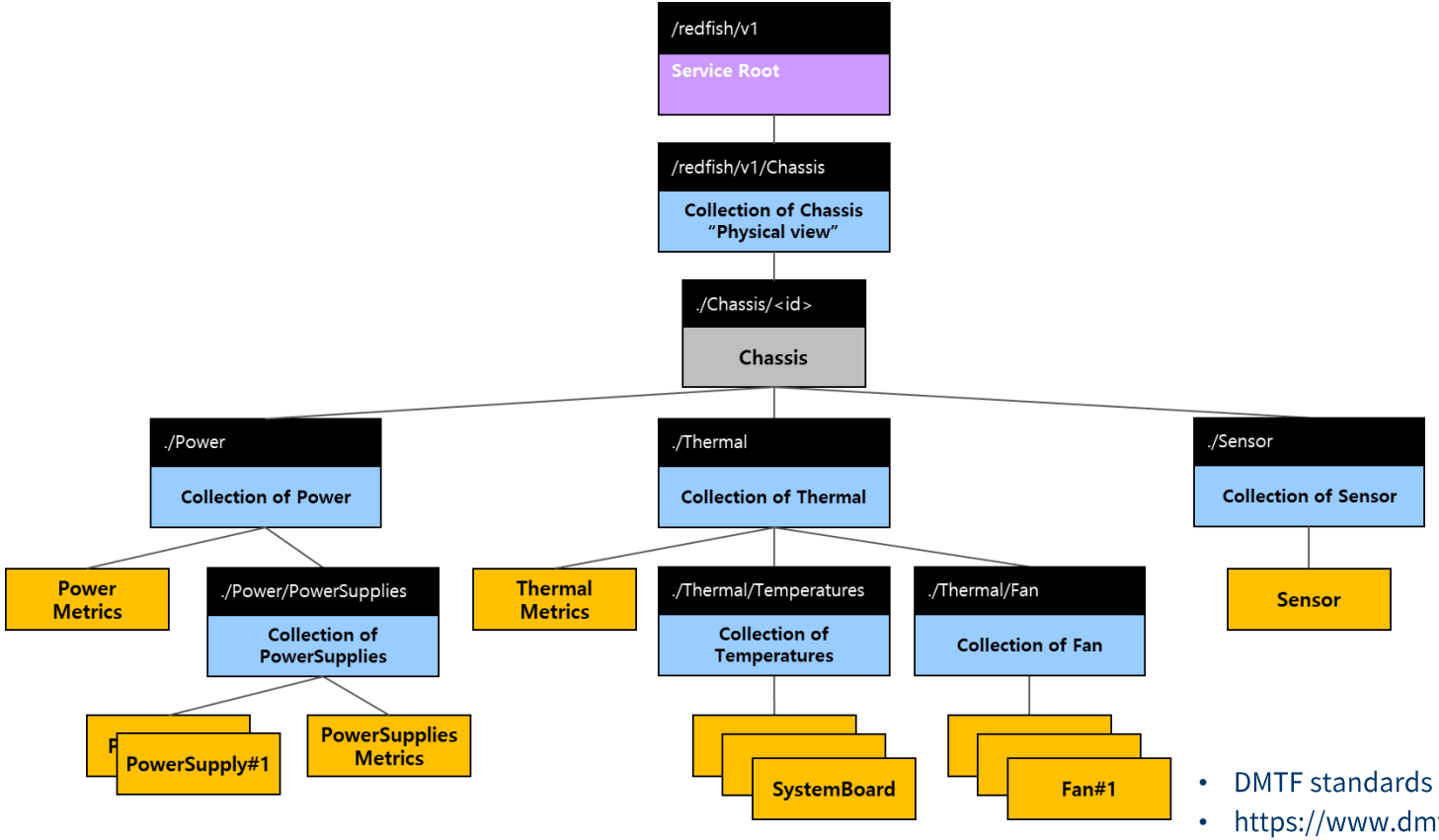
- BMC Hostname → PATCH /Managers/1/EthernetInterfaces/1
- License → GET /Managers/1/LicenseService
- BMC Reset → POST /Mamagers/1/Actions/Manager.Reset

Chassis Collection

- Power → GET /Chassis/1/Power/PowerMeter
- Thermal (Fan, Temperature) → GET /Chassis/1/Thermal

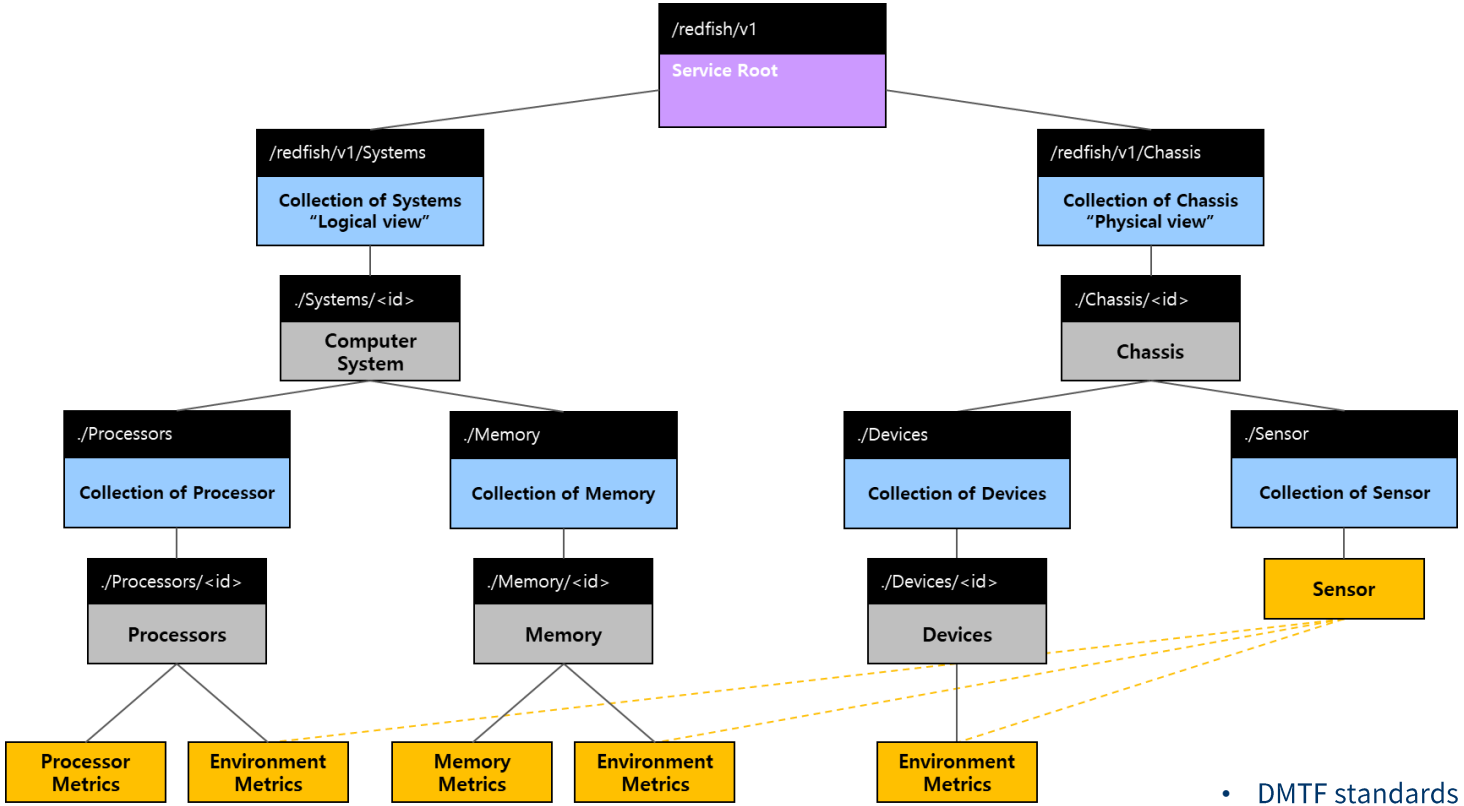


Power and Thermal tree



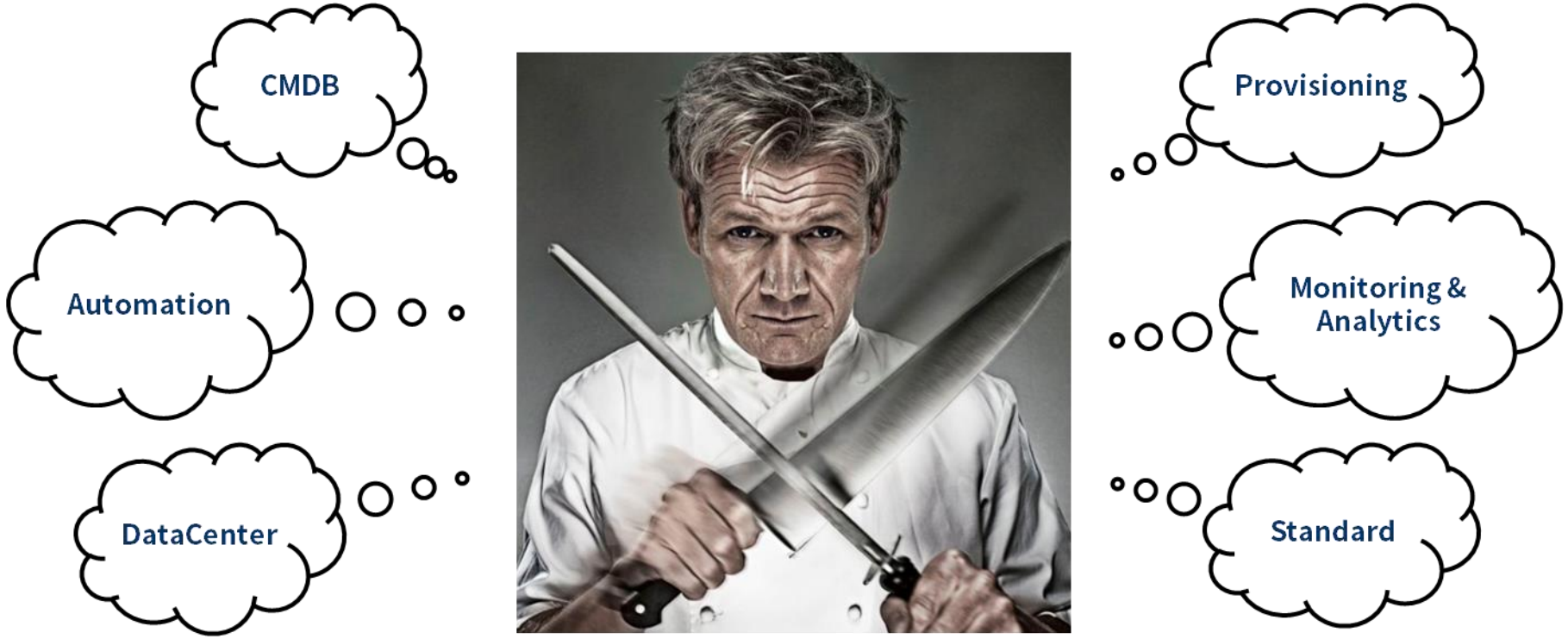
- DMTF standards doc 참조
- https://www.dmtf.org/dsp/DSP-IS0015

Resource tree

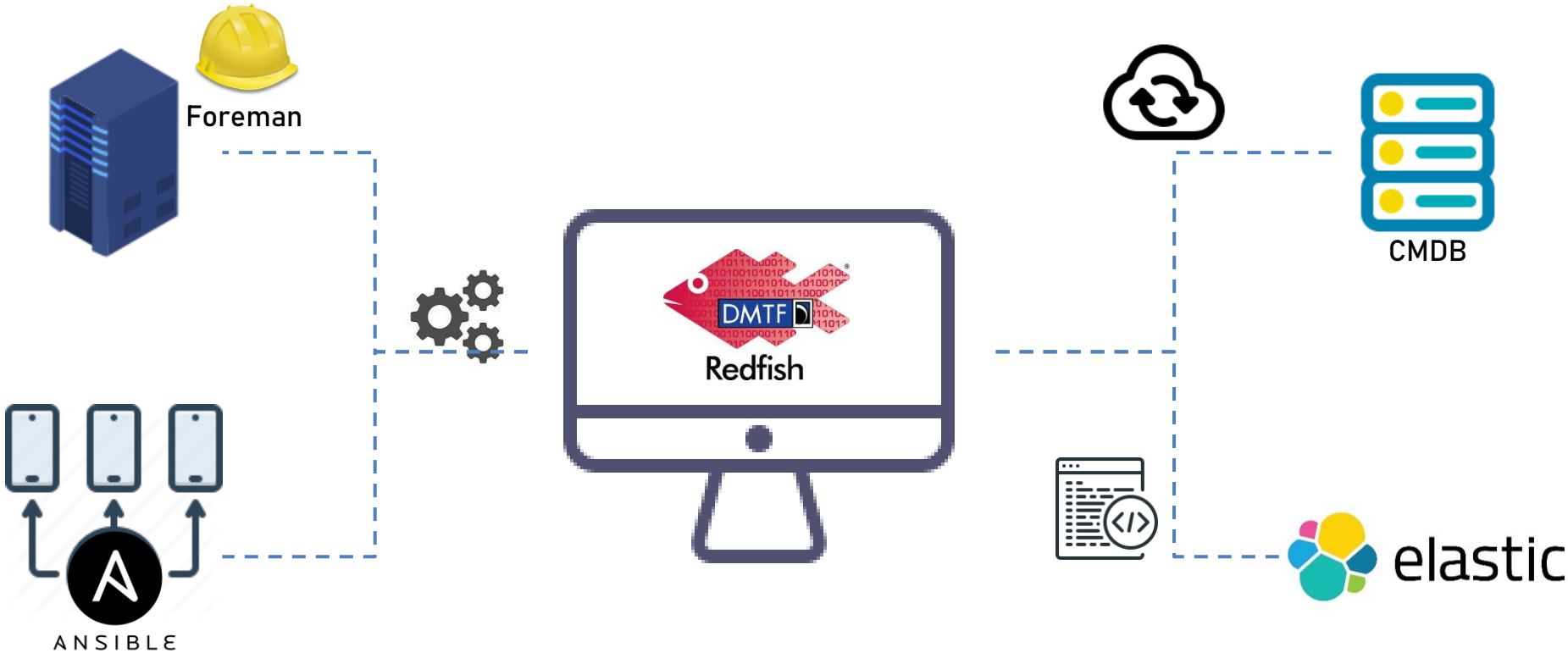


- DMTF standards doc 참조
- https://www.dmtf.org/dsp/DSP-IS0015

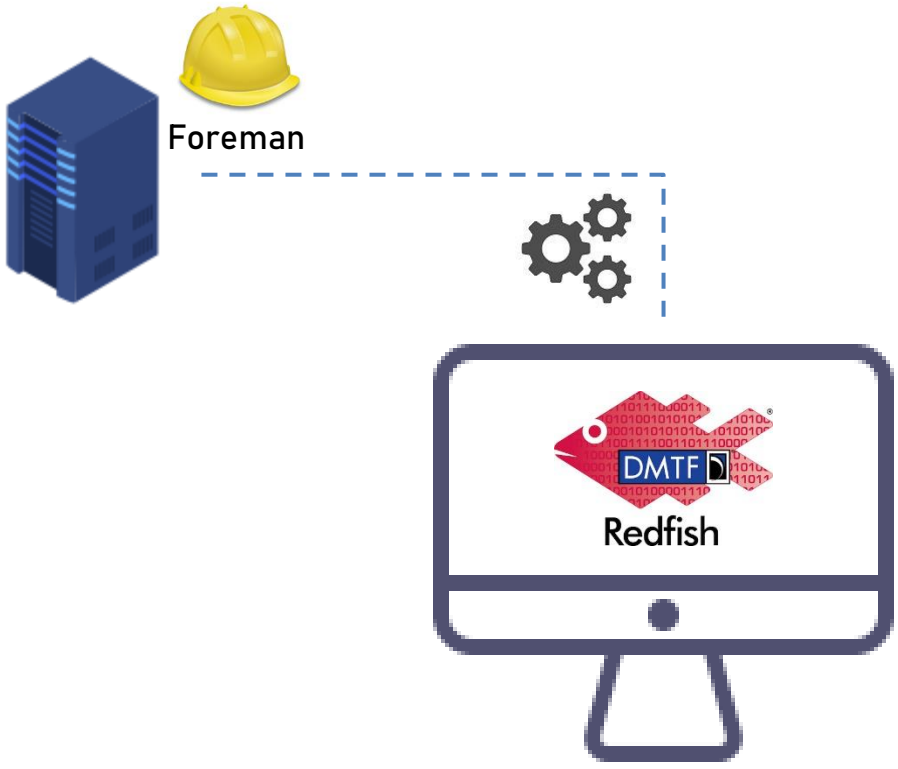
Redfish 레시피 고민 ?
단순 적용 No.. 플랫폼화 Yes!



Redfish 연동 시스템



Redfish 연동 시스템 - Foreman



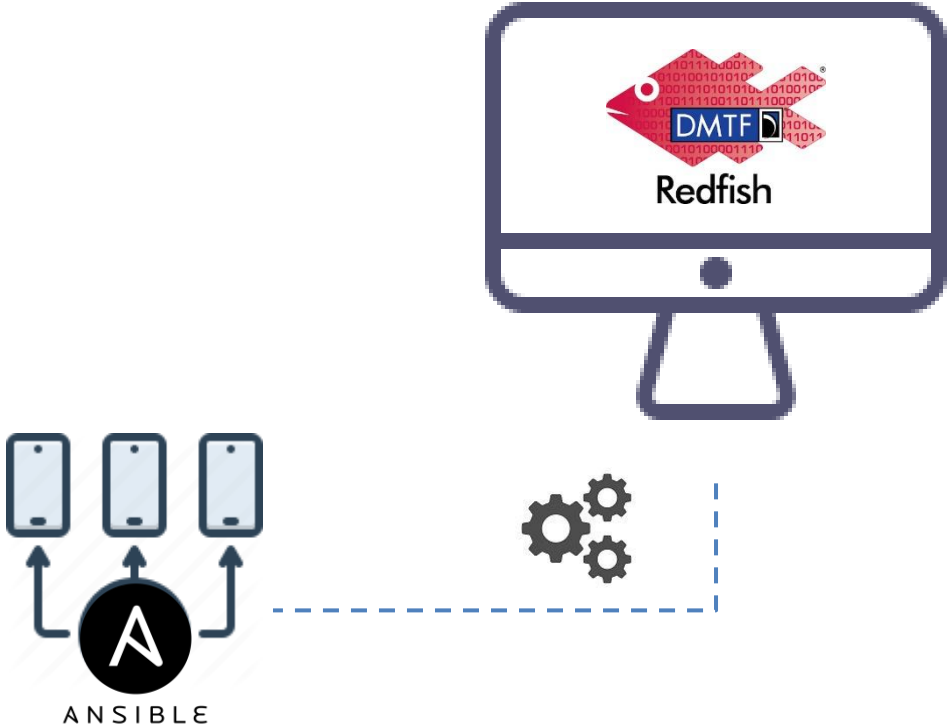
Foreman

- 오픈 소스 배포 플랫폼
- MaaS (Metal as a service)
- Redhat satellite 의 Core 엔진 사용

Redfish role

- 각 표준 서버 별 H/W 세부 설정 및 구성 자동화
- 자동 전원 컨트롤 및 Boot order 변경
- H/W 검수 자동화 및 누락 서버 전원 오프

Redfish 연동 시스템 - Ansible



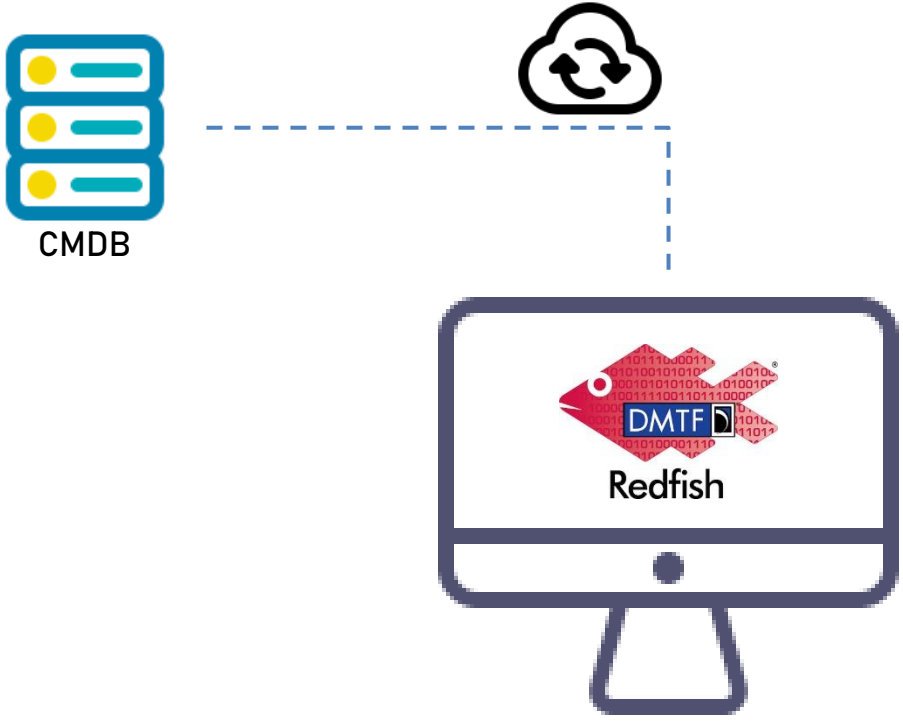
Ansible

- Redfish 컬렉션 별 연계 및 자동화
- 구성 자동화 템플릿 제작 및 배포
- 인프라 관리 포털 연동

Redfish role

- 인프라 관리 포털 자동화 기능 강화
- 비정기적 H/W 변경 & 구성 작업
- 인프라 관리 포털 명령셋 지원

Redfish 연동 시스템 - CMDB



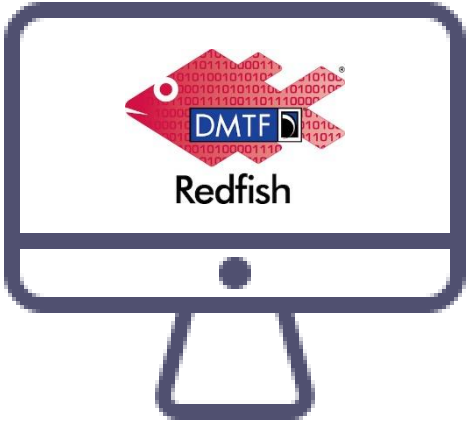
CMDB

- 주요 CM 정보 기록 및 조회
- Configuration & Lifecycle management
- 인프라/프로젝트/비용 관리
- 데이터센터 관리

Redfish role

- H/W 정보 제공
- 표준 서버/템플릿 별 주요 설정 지표 제공
- 주요 미터링 데이터 제공 (전력/온도)

Redfish 연동 시스템



elastic

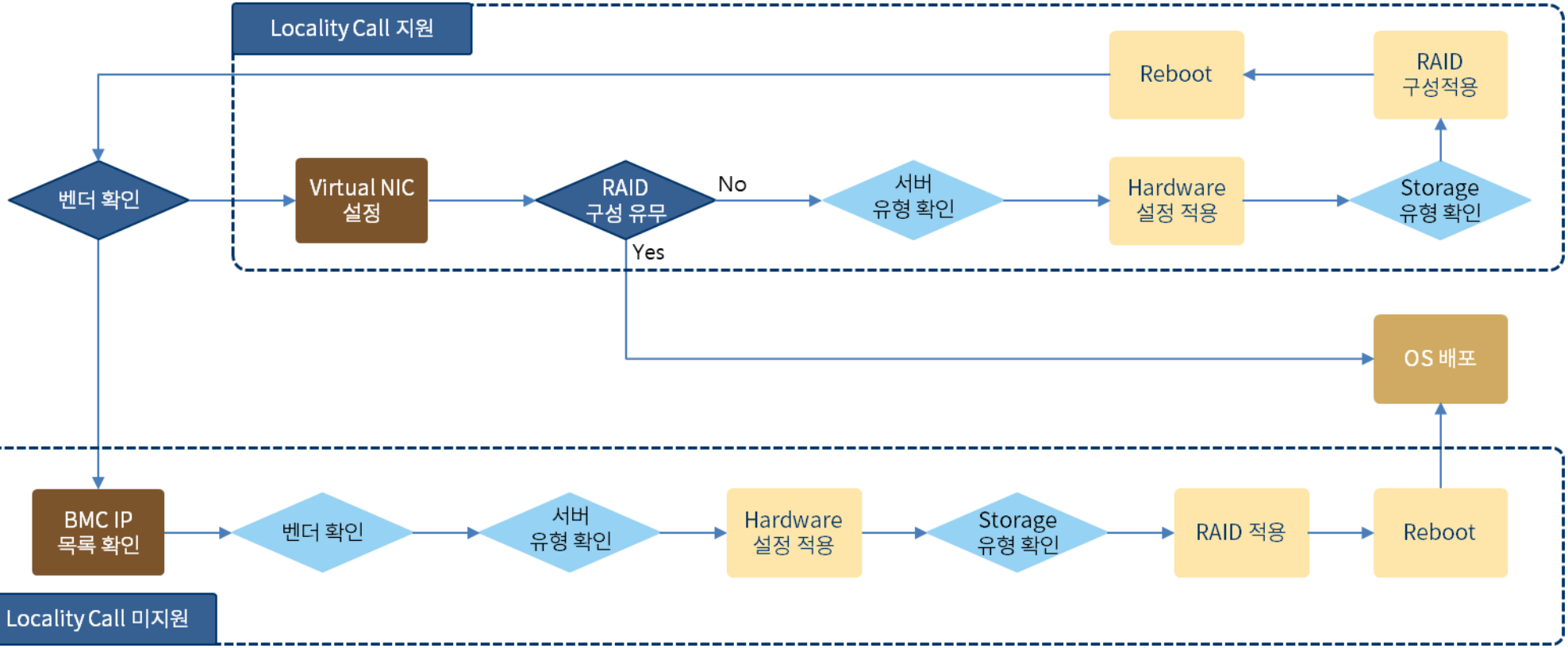
ELK

- 인프라 데이터 통계 수집
- Redfish 컬렉션 별 주요 데이터 적재
- 서버 및 데이터센터 관리 페이지 시각화

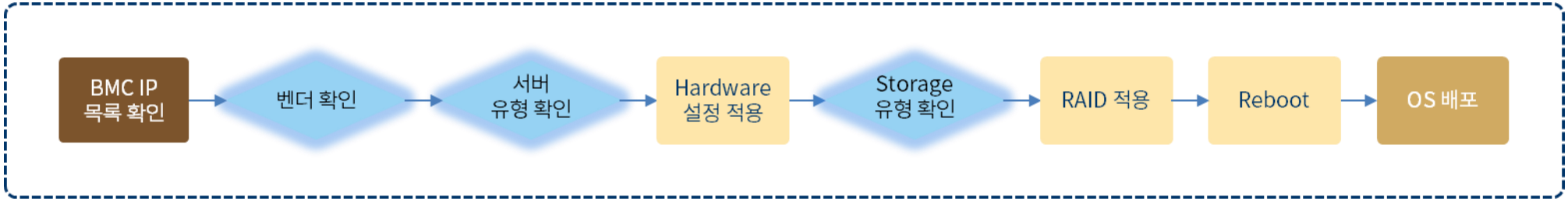
Redfish role

- Chassis 컬렉션 데이터 제공 (전력/온도)
- Manager 컬렉션 데이터 제공 (상태/로그)
- System 컬렉션 데이터 제공 (설정 데이터)

템플릿 기반 인프라 배포

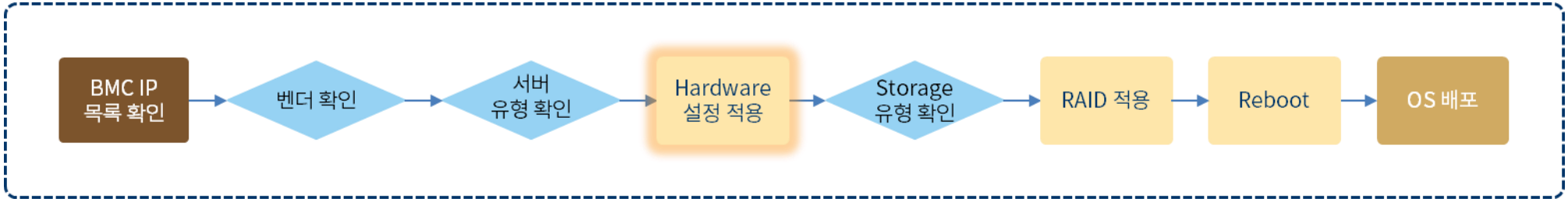

Locality Call 지원
Reboot
RAID
구성적용
벤더 확인
Virtual NIC
설정
RAID
구성 유무
No
서버
유형 확인
Hardware
설정 적용
Storage
유형 확인
Yes
OS 배포
BMC IP
목록 확인
벤더 확인
서버
유형 확인
Hardware
설정 적용
Storage
유형 확인
RAID 적용
Reboot
Locality Call 미지원

템플릿 기반 인프라 배포



구분	Function 1	Function 2
벤더 확인	GET /redfish/v1/ | jq .Vendor	GET /redfish/v1/ | jq .Product
서버 유형 확인	GET /redfish/v1/Systems/1 | jq '.ProcessorSummary | .Model' | \ awk '{print $3}'	GET /redfish/v1/Systems/1 | jq '.MemorySummary | \ .TotalSystemMemoryGiB'
Storage 유형 확인	GET /redfish/v1/Systems/1/SmartStorageconfig 2> /dev/null | \ jq '.PhysicalDrives' | grep '\"Location\"' | wc -l	GET /redfish/v1/Systems/1/SmartStorageconfig/ArrayControllers/0/ \ DiskDrives/2 | jq '.CapacityGB'

템플릿 기반 인프라 배포 (H/W parameter)



표준서버 타입		A Type	B Type
Profile		HighPerformanceCompute(HPC)	TransactionalApplicationProcessing
No	Attributes	Value	Value
16	BootMode	LegacyBios	LegacyBios
19	CollabPowerControl	Disabled	Disabled
37	EmbVideoConnection	AlwaysEnabled	AlwaysEnabled
41	EmbeddedUefiShell	Disabled	Disabled
44	EnergyEfficientTurbo	Disabled	Disabled
45	EnergyPerfBias	MaxPerf	MaxPerf
63	IntelProcVtd	Disabled	Disabled
65	InternalSDCardSlot	Disabled	Disabled
89	MinProcIdlePkgState	NoState	NoState
103	NumaGroupSizeOpt	Clustered	Flat
117	PowerRegulator	StaticHighPerf	StaticHighPerf
124	ProcVirtualization	Disabled	Disabled
125	ProcX2Apic	Disabled	Disabled
154	Sriov	Disabled	Disabled
156	SubNumaClustering	Disabled	Enabled
159	TimeFormat	Local	Local
165	UefiOptimizedBoot	Disabled	Disabled
173	UncoreFreqScaling	Maximum	Maximum
188	WorkloadProfile	HighPerformanceCompute(HPC)	TransactionalApplicationProcessing

BIOS_Profile1.json

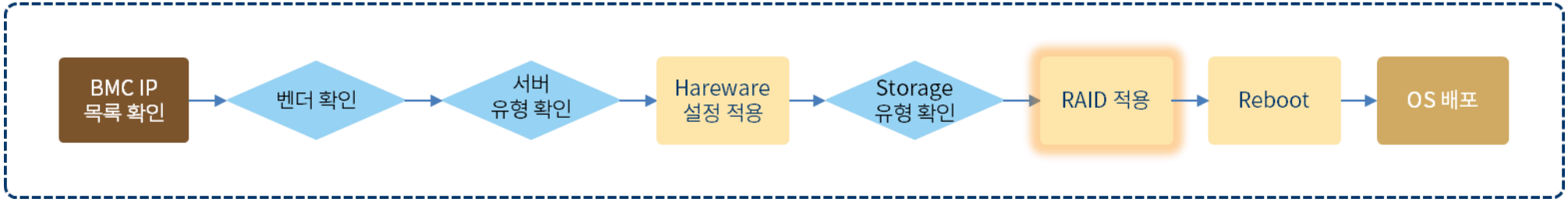
```
{
    "Attributes": {
        "BootMode"
        "CollabPowe
        "EmbVideoC
        "Embedded
        "EnergyEffic
        "EnergyPerf
        "IntelProcVt
        "InternalSDC
        "MinProcIdl
        "MinProcIdl
        "PowerRegu
        "ProcX2Apic
        "SubNumaC
        "TimeForma
        "UefiOptimi
        "UncoreFrec
        "WorkloadP
    }
}
```

BIOS_Profile2.json

```
{
    "Attributes": {
        "BootMode": "LegacyBios",
        "CollabPowerControl": "Disabled",
        "EmbVideoConnection": "AlwaysEnabled",
        "EmbeddedUefiShell": "Disabled",
        "EnergyEfficientTurbo": "Disabled",
        "EnergyPerfBias": "MaxPerf",
        "IntelProcVtd": "Disabled",
        "InternalSDCardSlot": "Disabled",
        "MinProcIdlePkgState": "NoState",
        "MinProcIdlePower": "NoCStates",
        "NumaGroupSizeOpt": "Clustered",
        "PowerRegulator": "StaticHighPerf",
        "ProcVirtualization": "Disabled",
        "ProcX2Apic": "Disabled",
        "Sriov": "Disabled",
        "TimeFormat": "Local",
        "UefiOptimizedBoot": "Disabled",
        "UncoreFreqScaling": "Maximum",
        "WorkloadProfile": "Custom"
    }
}
```

구분	설명	
HTTP Method	PATCH	
URI	/redfish/v1/Systems/{id}/Bios/Settings	
Request Data (-d)	redfishtool	'{"Attributes": {…}}'
	curl	"@BIOS_Profile1.json"
{id}	HPE, Lenovo	1
	Dell	System.Embedded.1

템플릿 기반 인프라 배포 (storage)



RAID_OS.json

```
{
    "DataGuard": "D
    "LogicalDrives":
        {
            "Capacity
            "Raid": "Ra
            "StripSize
            "LogicalDr
            "DataDrive
                "1I:1:1",
                "1I:1:2"
            ],
            "Accelerat
        }
    ]
}
```

RAID_DATA_2.4T-6.json

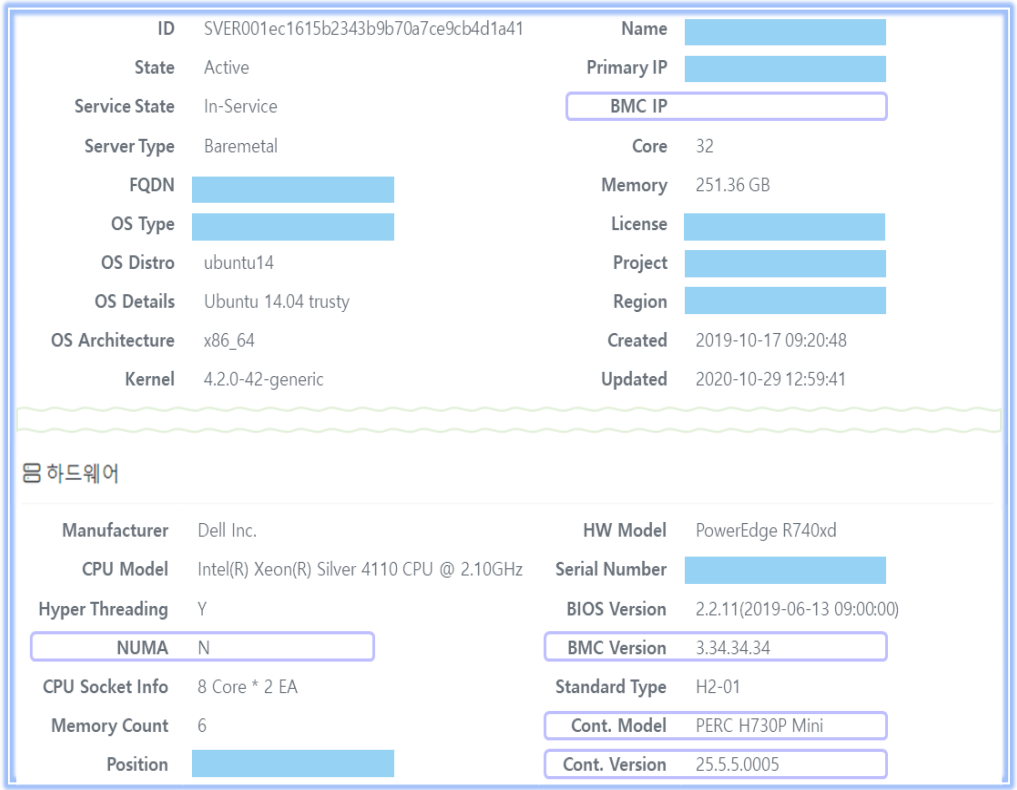
```
{
    "DataGuard": "Disab
    "LogicalDrives": [
        {
            "CapacityGiB":
            "Raid": "Raid1
            "StripSizeByte
            "LogicalDriveN
            "DataDrives": [
                "1I:1:3",
                "1I:1:4",
                "2I:1:5",
                "2I:1:6",
                "2I:1:7",
                "2I:1:8"
            ],
            "Accelerator":
        }
    ]
}
```

RAID_DATA_960-6.json

```
{
    "DataGuard": "Permissive",
    "LogicalDrives": [
        {
            "CapacityGiB": 2682,
            "Raid": "Raid10",
            "StripSizeBytes": 262144,
            "LogicalDriveName": "DataLD",
            "DataDrives": [
                "1I:1:3",
                "1I:1:4",
                "2I:1:5",
                "2I:1:6",
                "2I:1:7",
                "2I:1:8"
            ],
            "Accelerator": "IOBypass"
        }
    ]
}
```

구분	설명	
HTTP Method	PUT	
URI	/redfish/v1/Systems/1/SmartStorageConfig/Settings	
Request Data (-d)	redfishtool	‘{“DataGuard”: {…}}’
	curl	“@RAID_OS.json”

CMDB 연동



ID	SVER001ec1615b2343b9b70a7ce9cb4d1a41	Name	
State	Active	Primary IP	
Service State	In-Service	BMC IP	
Server Type	Baremetal	Core	32
FQDN		Memory	251.36 GB
OS Type		License	
OS Distro	ubuntu14	Project	
OS Details	Ubuntu 14.04 trusty	Region	
OS Architecture	x86_64	Created	2019-10-17 09:20:48
Kernel	4.2.0-42-generic	Updated	2020-10-29 12:59:41

하드웨어

Manufacturer	Dell Inc.	HW Model	PowerEdge R740xd
CPU Model	Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz	Serial Number	
Hyper Threading	Y	BIOS Version	2.2.11(2019-06-13 09:00:00)
NUMA	N	BMC Version	3.34.34.34
CPU Socket Info	8 Core * 2 EA	Standard Type	H2-01
Memory Count	6	Cont. Model	PERC H730P Mini
Position		Cont. Version	25.5.5.0005

BMC IP
GET /Managers/iDRAC.Embedded.1/EthernetInterfaces/iDRAC.Embedded.1%23NIC.1
| jq '.IPv4Addresses[] | {"Address": .Address}'

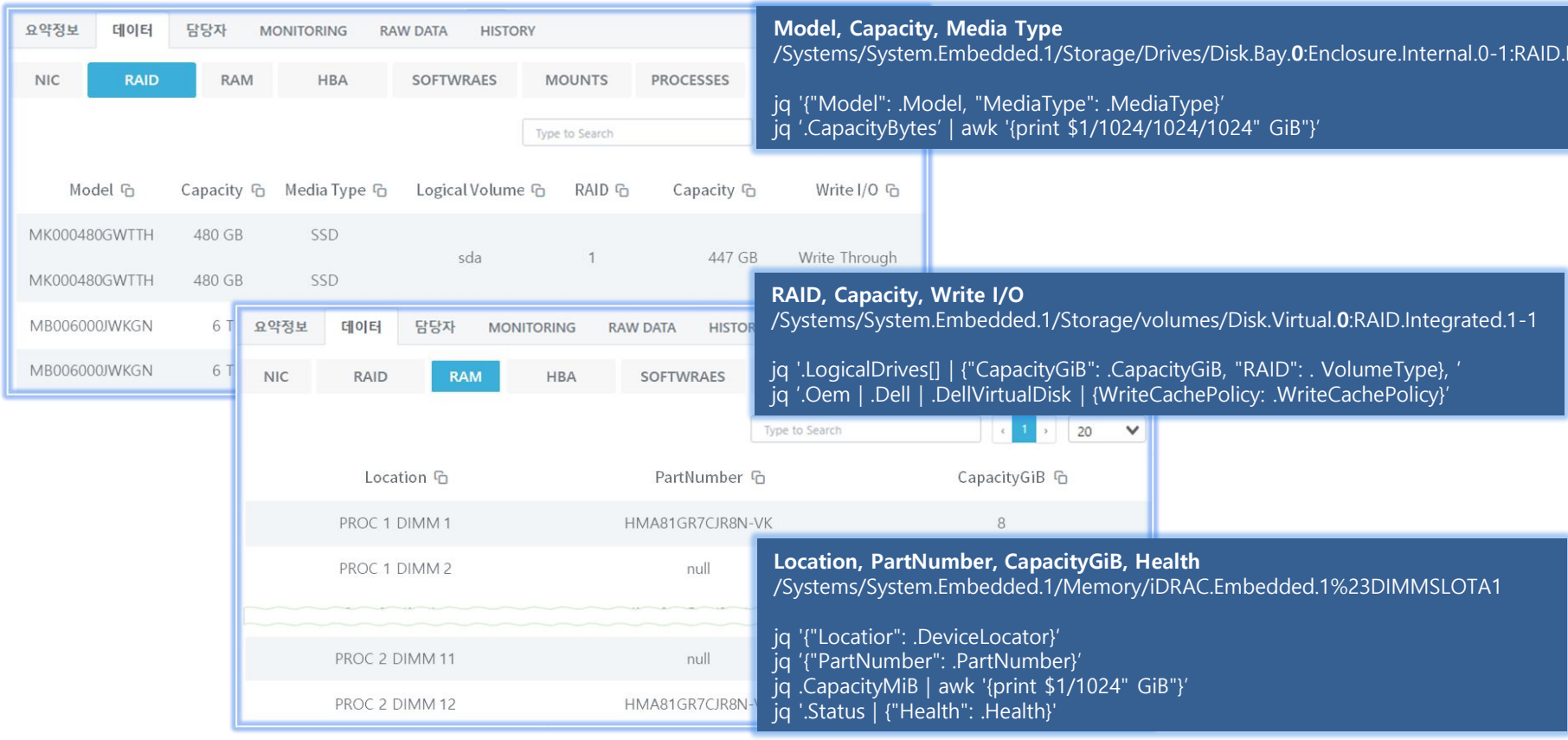
BMC Version
GET /Managers/iDRAC.Embedded.1 |
jq '{"FirmwareVersion": .FirmwareVersion}'

NUMA
GET /Systems/System.Embedded.1/Bios |
jq '.Attributes | {"NUMA": . SubNumaCluster}'

RAID Controller Model
GET '/Systems/System.Embedded.1/Storage/RAID.Integrated.1-1 |
jq ' {Model: .Name}'

RAID Controller Version
GET '/Systems/System.Embedded.1/Storage/RAID.Integrated.1-1 |
jq '.StorageControllers[] | {FirmwareVersion: .FirmwareVersion}'

CMDB 연동



Model, Capacity, Media Type
/Systems/System.Embedded.1/Storage/Drives/Disk.Bay.**0**:Enclosure.Internal.0-1:RAID.Integrated.1-1

```
jq '{"Model": .Model, "MediaType": .MediaType}'
jq '.CapacityBytes' | awk '{print $1/1024/1024/1024" GiB"}'
```

RAID, Capacity, Write I/O
/Systems/System.Embedded.1/Storage/volumes/Disk.Virtual.**0**:RAID.Integrated.1-1

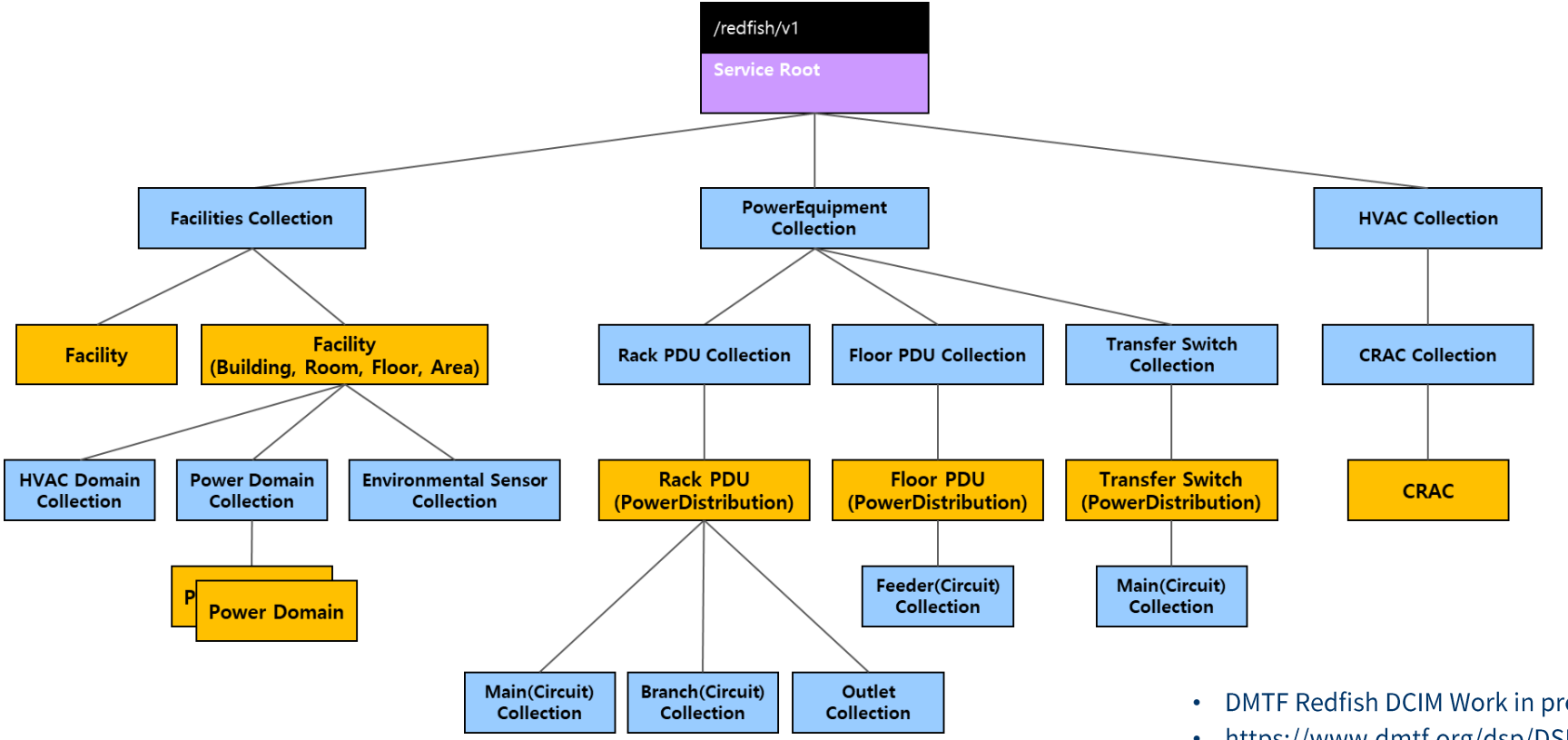
```
jq '.LogicalDrives[] | {"CapacityGiB": .CapacityGiB, "RAID": . VolumeType}, '
jq '.Oem | .Dell | .DellVirtualDisk | {WriteCachePolicy: .WriteCachePolicy}'
```

Location, PartNumber, CapacityGiB, Health
/Systems/System.Embedded.1/Memory/iDRAC.Embedded.1%23DIMMSLOTA1

```
jq '{"Locatior": .DeviceLocator}'
jq '{"PartNumber": .PartNumber}'
jq .CapacityMiB | awk '{print $1/1024" GiB"}'
jq '.Status | {"Health": .Health}'
```

Next Steps
(Enhanced DCIM)

Redfish DCIM tree (For own Datacenter)



- DMTF Redfish DCIM Work in progress 참조
- https://www.dmtf.org/dsp/DSP-IS0005

DCIM (Serverside#1)

Redfish Broker
Redfish Client

L사 전력 수집

```
/Chassis/1/Power \
jq '.PowerControl[0] | .PowerMetrics' |
{"Average": .AverageConsumedWatts,
"Maximum": .MaxConsumedWatts,
"Minimum": .MinConsumedWatts}'
```

DCIM (Serverside#2)

Redfish Broker
Redfish Client

Log URI

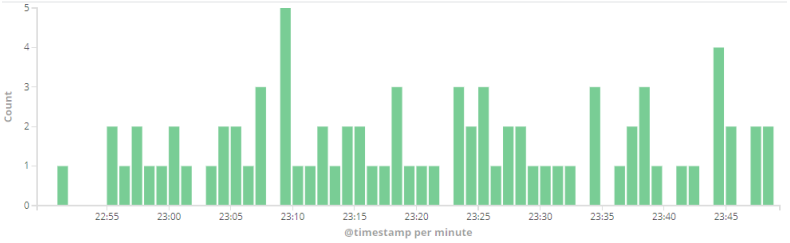
/Managers/iDRAC.Embedded.1/LogServices/Sel/Entries
/Managers/iDRAC.Embedded.1/LogServices/Lclog/Entries
/Managers/iDRAC.Embedded.1/LogServices/FaultList/Entries

/Systems/1/LogServices/IML/Entries
/Managers/1/LogServices/IEL/Entires
/Systems/1/LogServices/SL/Entries

/Systems/1/LogServices/StandardLog/Entries
/Systems/1/LogServices/ActiveLog/Entries
/Systems/1/LogServices/MaintenanceLog/Entries

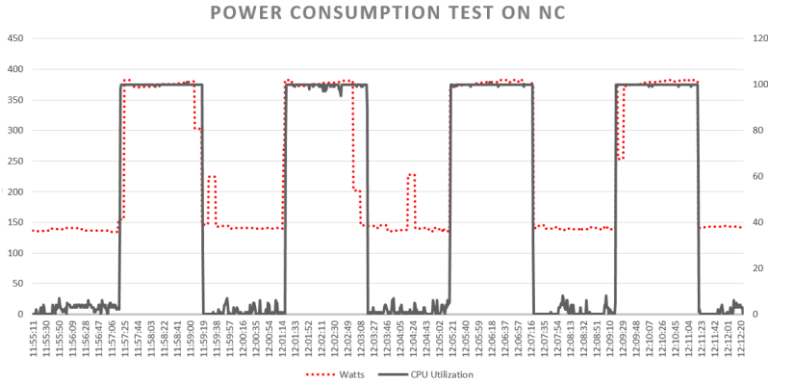
elastic

Performance & load testing



Event Levels

Count	Level	Count
79	경고	79
2	오류	2



글로벌 인프라 확대 적용


elastic
Foreman
DMTF
Redfish
elastic
Foreman
DMTF
Redfish
elastic
Foreman
DMTF
Redfish
elastic
Foreman
DMTF
Redfish
Korea
NA
Japan
EU
NC
인프라
서비스
Taiwan
APAC
Russia
Etcs
VN
China

END OF DOCUMENT

Q & A