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HW Monitoring and Management System for Telco Data Center

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Agenda

Infrastructure Revolution

Infrastructure Management in VIM & MEC

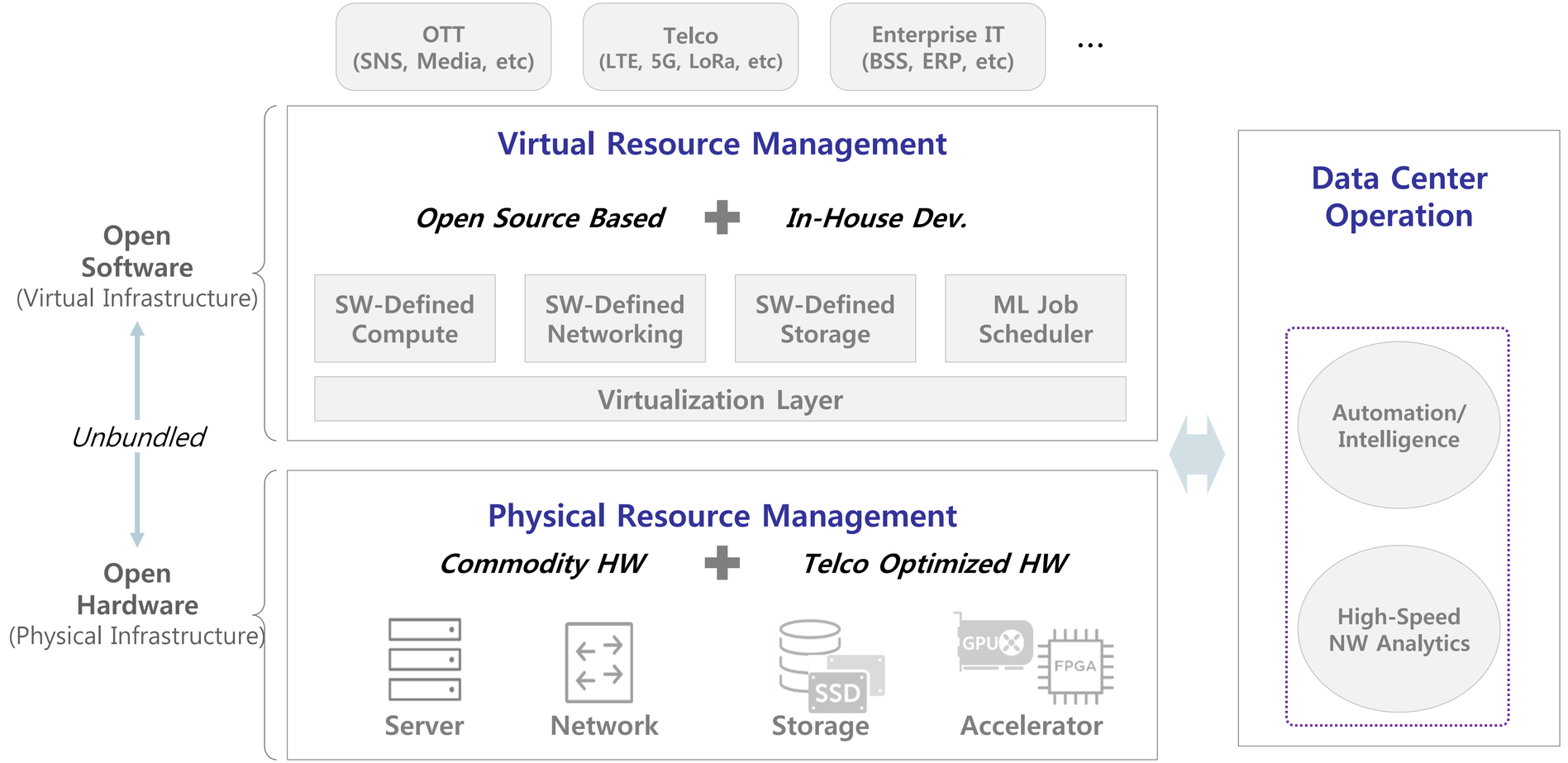
HMS Overview

- Objectives
- Automated HW Lifecycle Management
- Architecture
- Open Source in HMS
- Centralized vs. Distributed
- Demo

Future Work

Infrastructure Revolution

- **Mobile network and data center are converging towards open HW & SW based infrastructure**

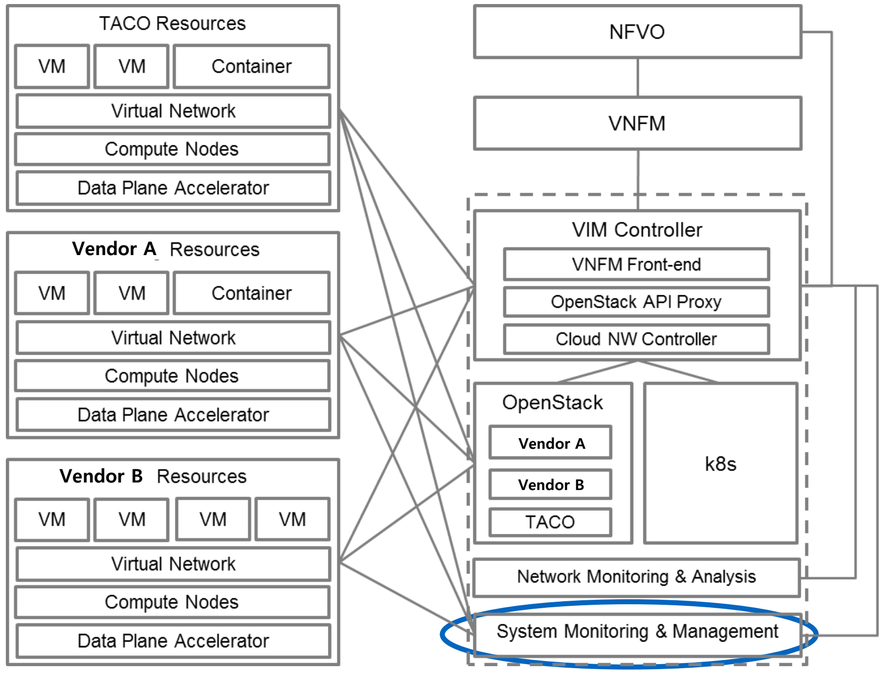


● Software-Defined Infrastructure ● Open Hardware and Software ● Universal Platform for Diverse Applications

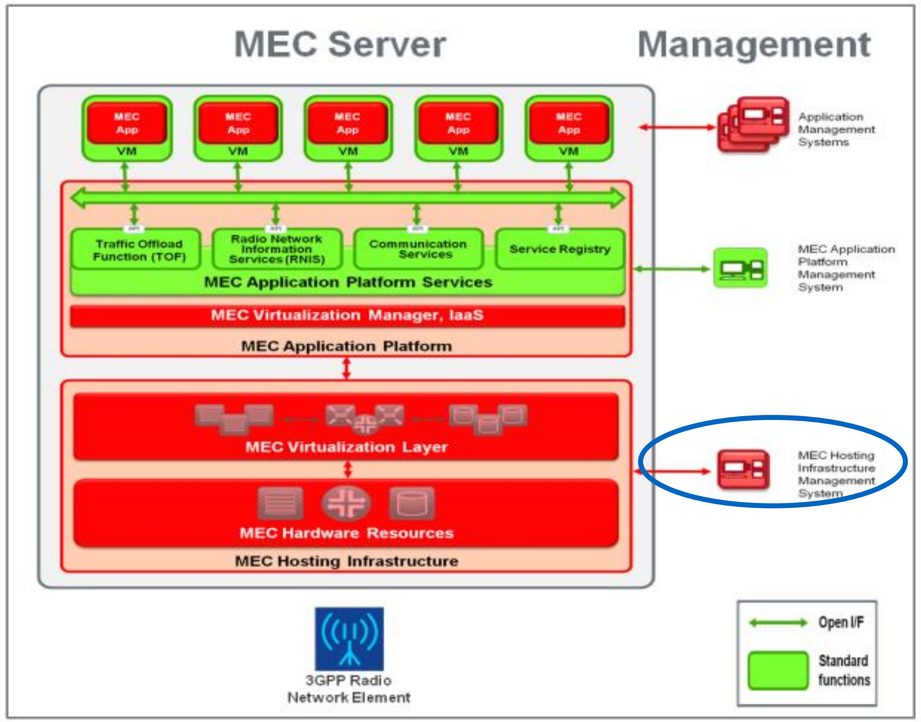
Infrastructure Management

- **Management of NFV and MEC's physical & virtual resources is integral part of 5G building blocks,**
- **Needs another layer of hardware management system**

SKT VIM Ref. Architecture



Multi-access Edge Computing Architecture



Source: ETSI Mobile-Edge Computing Technical White Paper, 2014

- Infrastructure Management System Requirements
  - Support physical & virtual resources
  - Vendor neutral system
  - Automation & Intelligence

: Infrastructure Management System

Hardware Management System

	【 Existing System 】	【 HMS 】
Collected Data	• **OS Level Info** - hostname - serial number - OS version - CPU info - Network Info - etc.	• **HW Level Info** - Chassis/Board Info - BMC info - Inlet/Outlet Temperature - Power/Fan - PCIe device/Memory module - etc.
Mgmt. Network	• **In-Band**	• **In-Band & Out-Of-Band**
Monitoring	• **Separated**	• **Unified**
Change Mgmt.	• **Manual + Automatic**	• **Full Automatic**

Expands Infra Mgmt. Scope

- **HW Level Info:** Collecting low level H/W info like BMC F/W, Temp, Power, Fan, GPU, Memory module etc.
- **Standardized Data Collection:** standardize HW information of heterogeneous systems and support next-gen protocols
- **Automated Change Management:** Periodical H/W information collection enables detection of H/W changes
- **OOB Management:** Out-of-Band system management enables off-line system management

Objectives

- **Have an deep knowledge of data center hardware components**
  - Asset Data: Memory, GPU, NIC, Raid Controller (location/form factor/asset tag/serial/manufacture ...) etc.
  - Sensor data : Inlet/outlet Temperature, Power Usage etc.

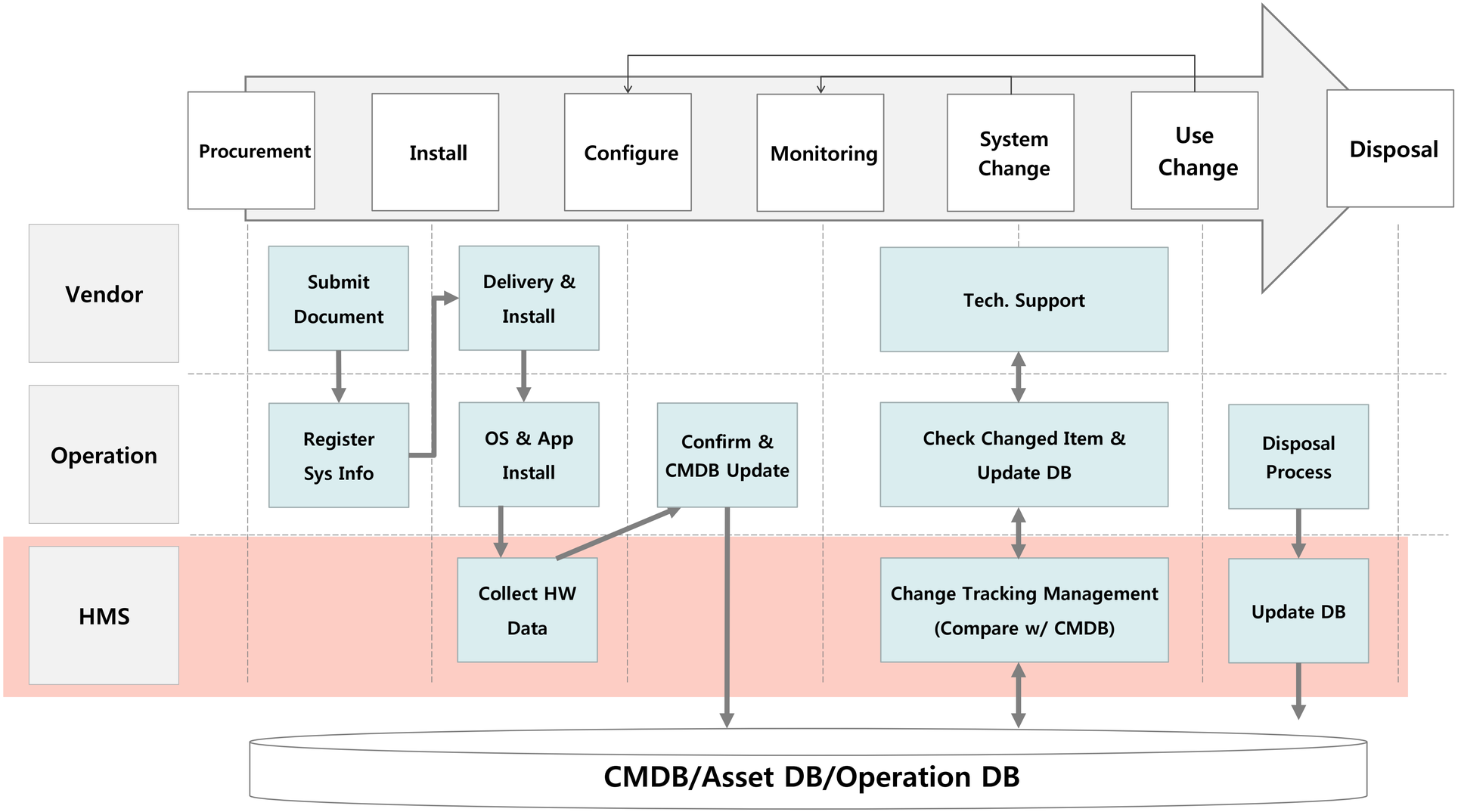
- **Automated change management and asset register**
  - Automatically detects any hardware and configuration changes
  - Updates asset DB only with the machine generated code to reduce human error
    - ex. Dell Power Edge R720, PE R720, Dell 720 … , Serial Number, Mac Address

- **Vendor neutral management**
  - Supports both off-the-shelf system and open source hardware
  - Mapping vendor specific keys to the standardized item

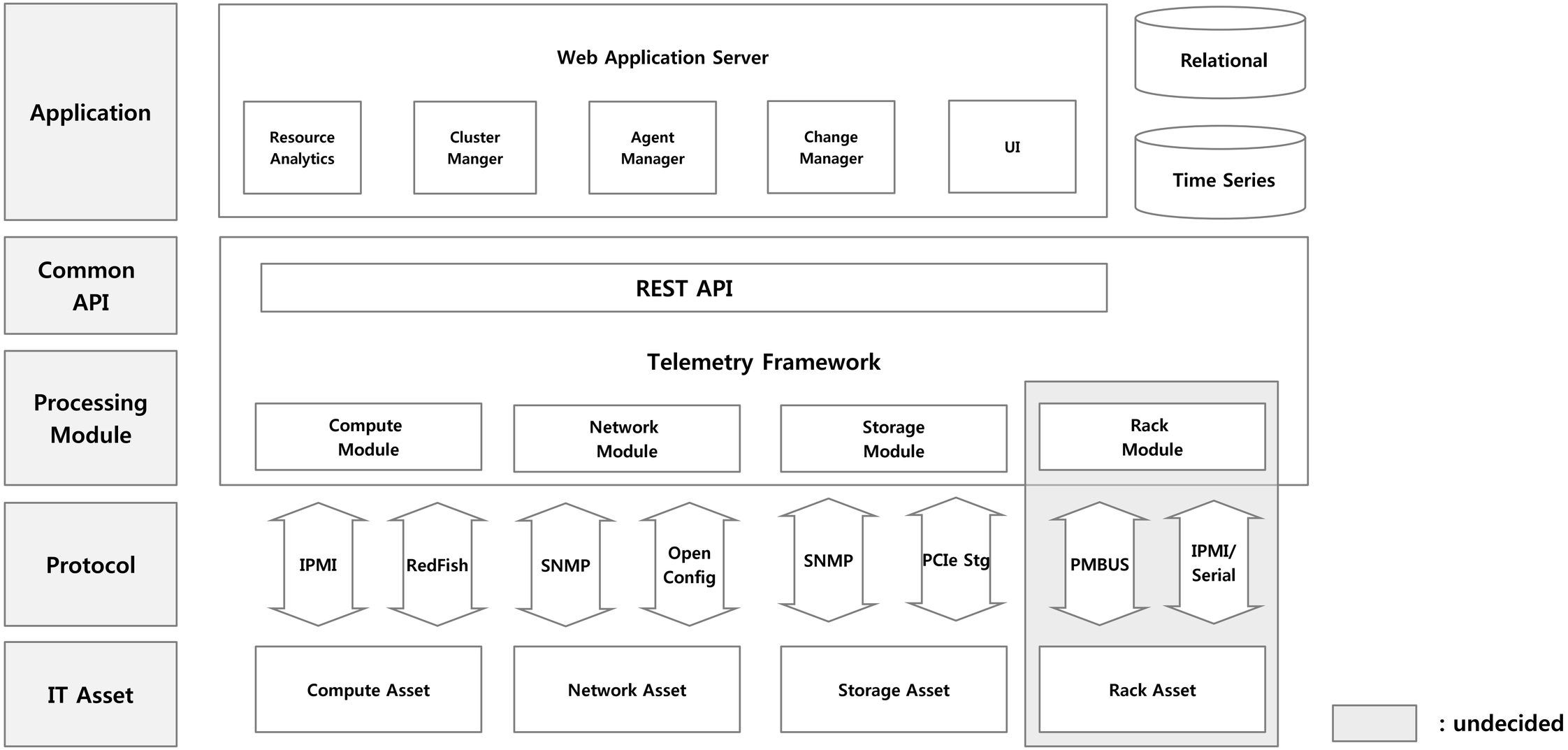
- **Flexible system**
  - Adding new devices or components easily
  - ex) GPU, Accelerator card etc.

Automated HW Management

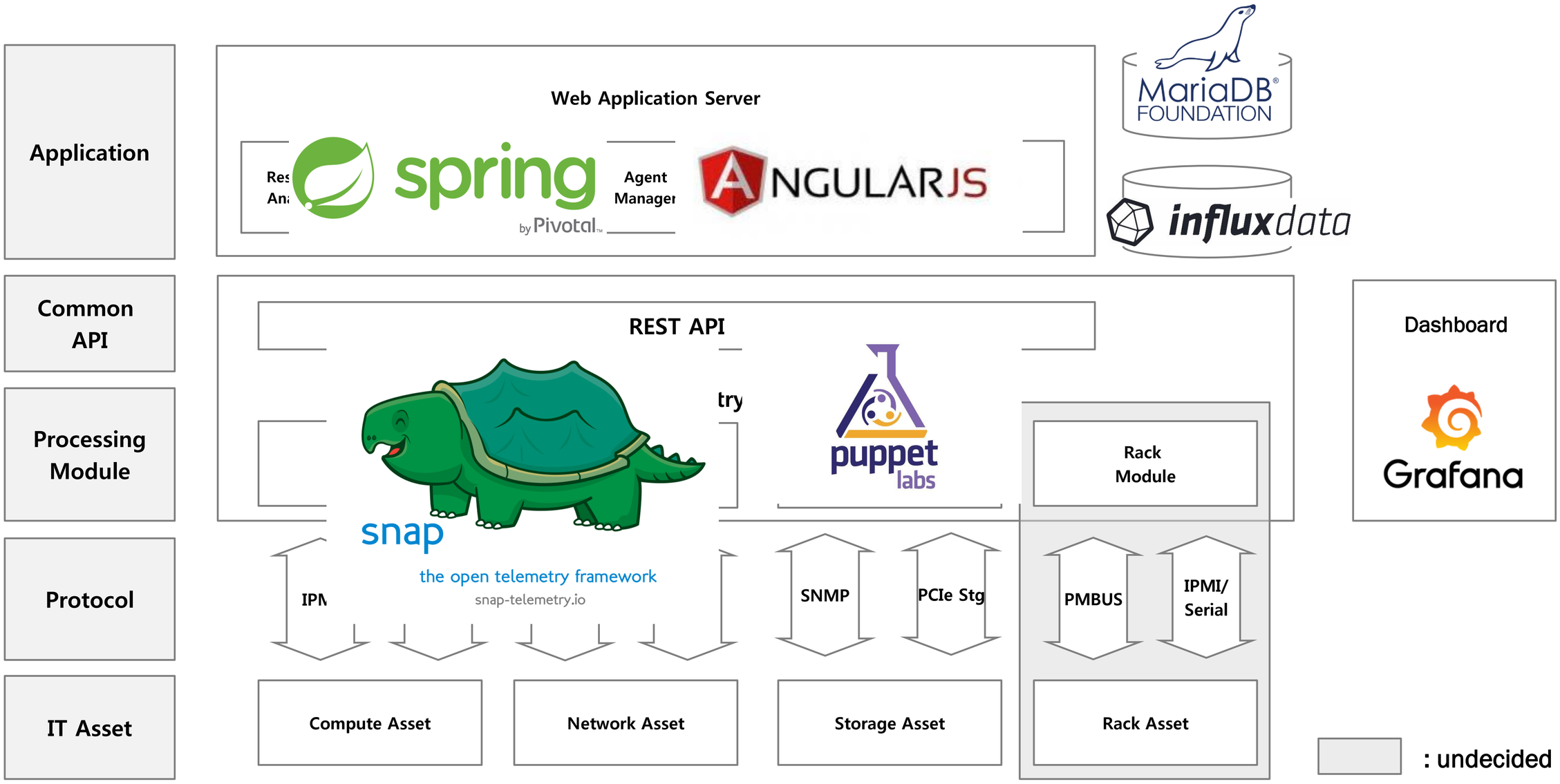
- Minimizes human interferences, and detects system installation and changes automatically



Architecture



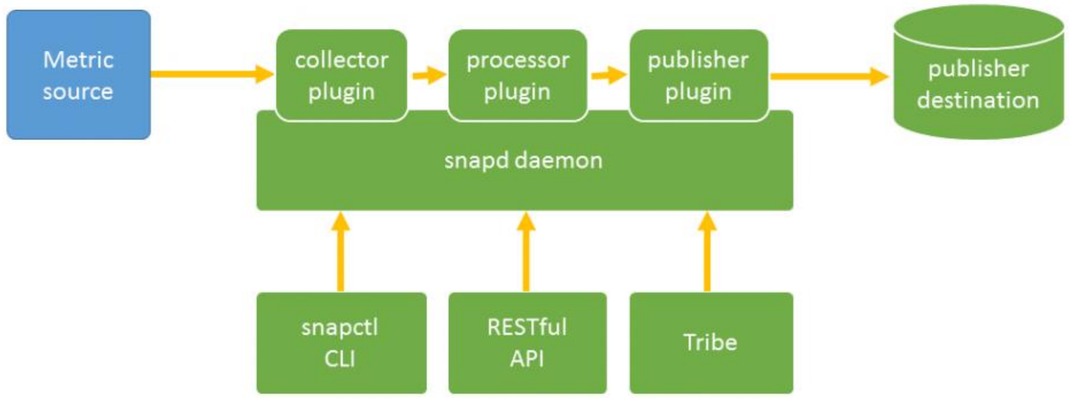
Open Source SW in HMS

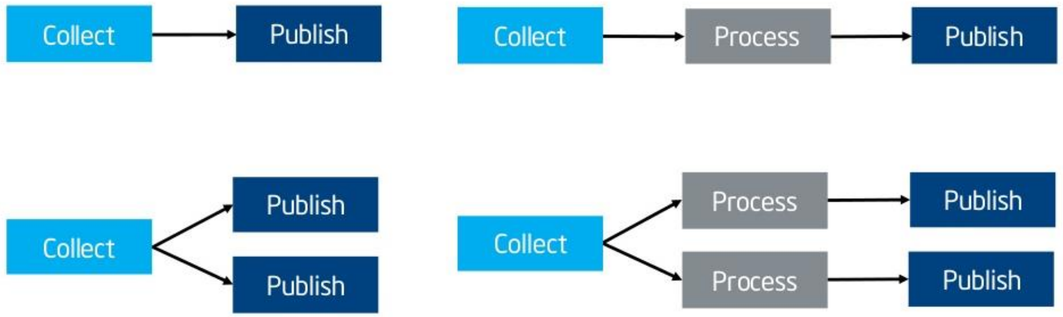


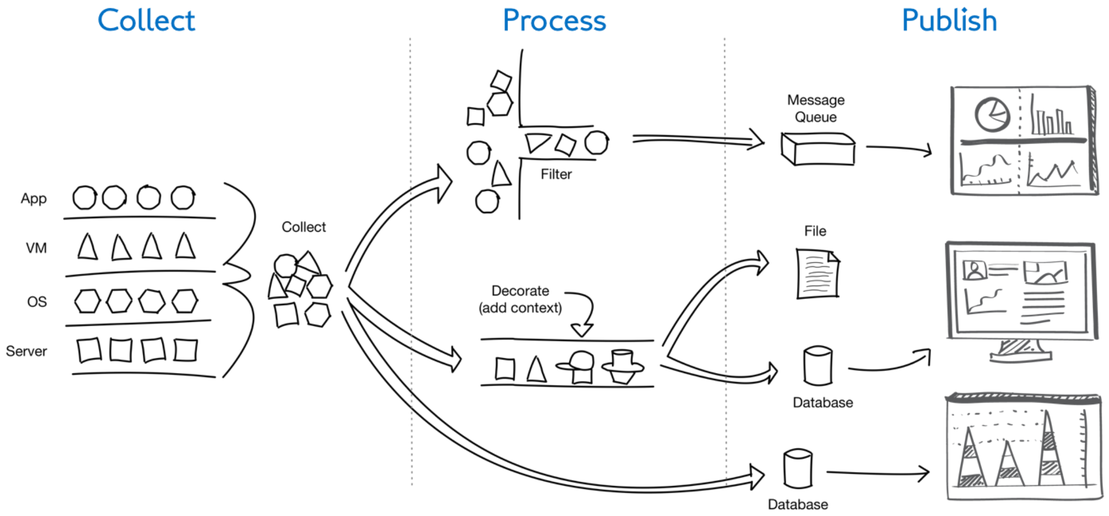
SNAP Introduction

Snap is an open telemetry framework designed to simplify the collection, processing and publishing of system data through a single API

- REST & CLI
- Flexible Scheduling
- Plugin Lifecycle Management
- Tribe (Clustering)



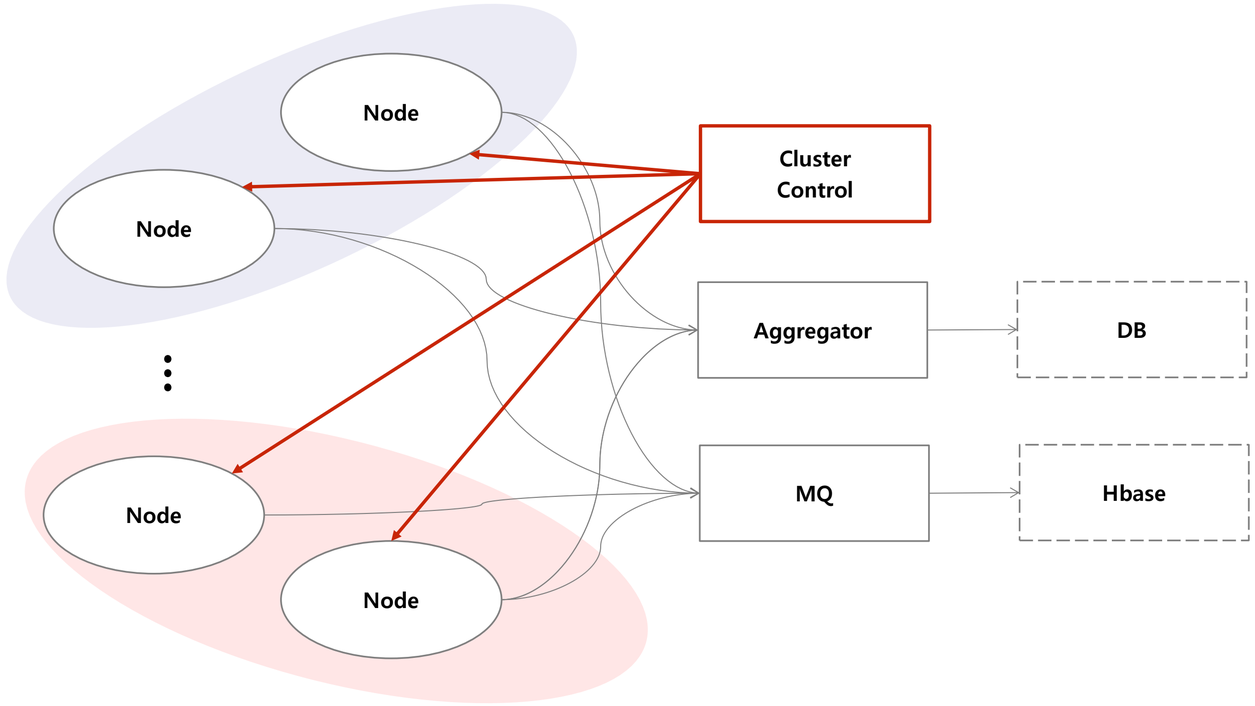




Source: https://www.slideshare.net/MatthewBrender/intro-to-open-source-telemetry-linux-con-2016

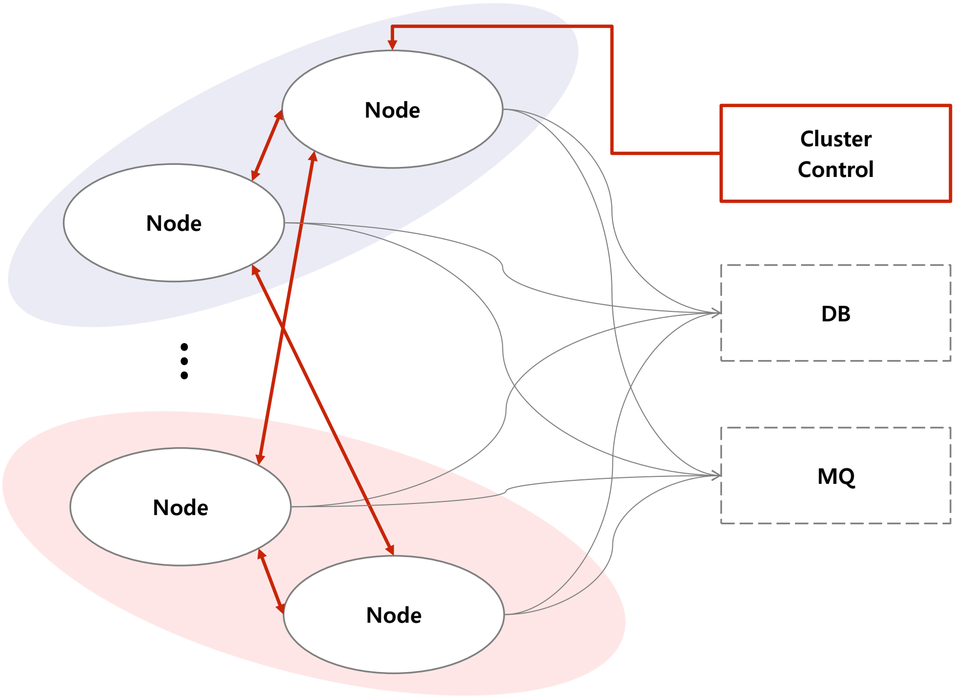
Centralized vs. Distributed

Legacy



- A controller manages each node's configuration and plugins
- A node agent sends raw data, and the aggregator process (if necessary) and publish the data to the database
- The cluster controller manages the groups

SNAP



- A controller only sends each groups configurations and plugins to one of the nodes, and the SNAP takes care of rest of the tasks
- The node's agent can collect, process and publish the data
- No central group manger needed

Plugins

- Developed three collector plugins to collect unsupported hardware data and a processor plugin to process raw data
- Collecting, post-processing, and publishing all done at the agent node

Collector

Facter
System Information
~200 metrics

HW Component
Dmidecode/lspci/smartctl
~510 metrics

IPMI
BMC, Fan, Temp, Power …
~30 metrics

NVIDIA SMI
Temp, Fan, Power, Util. …
~30 metrics

Processor

Tag
Tagging custom data

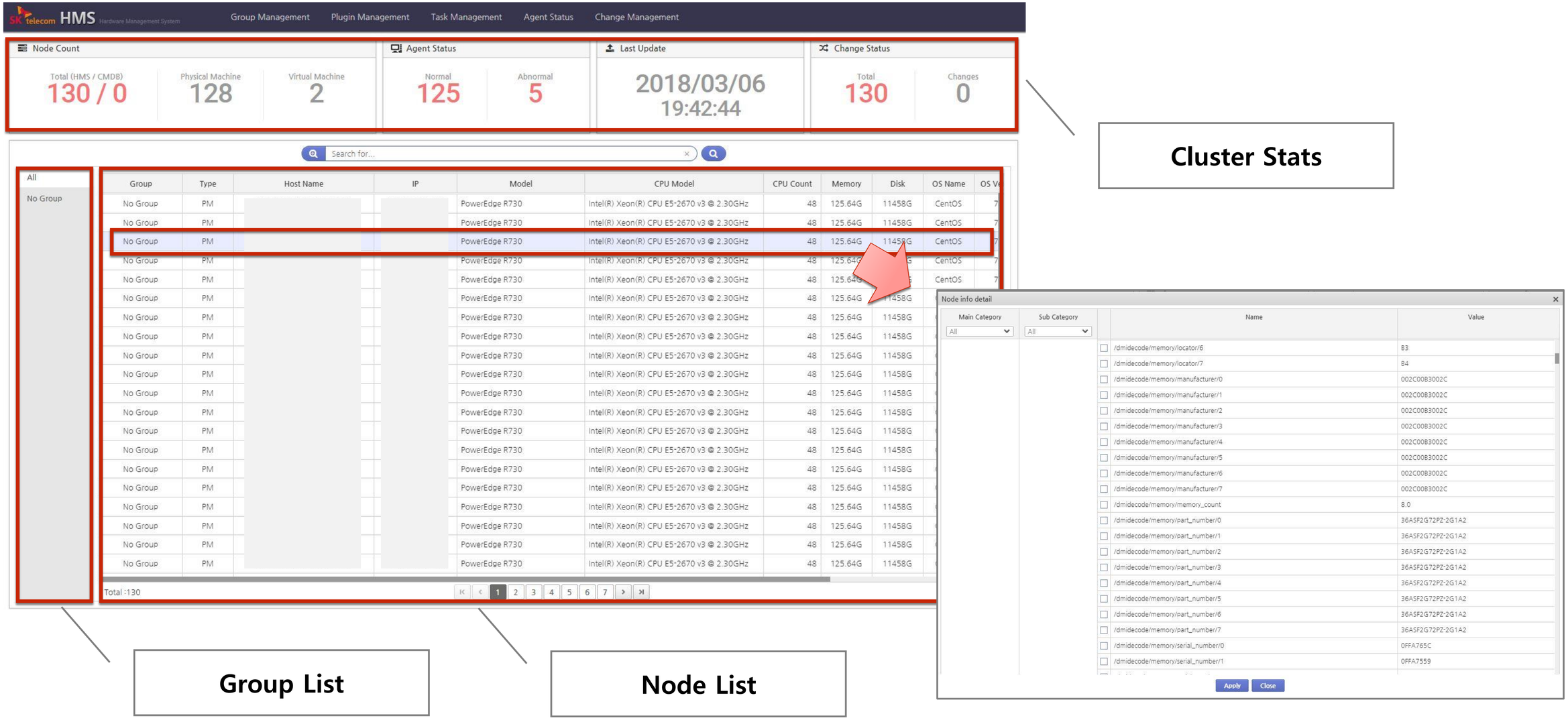
Publisher

InfluxDB
For time series data

: Plugin developed

: Open source plugin

HMS – Main Page



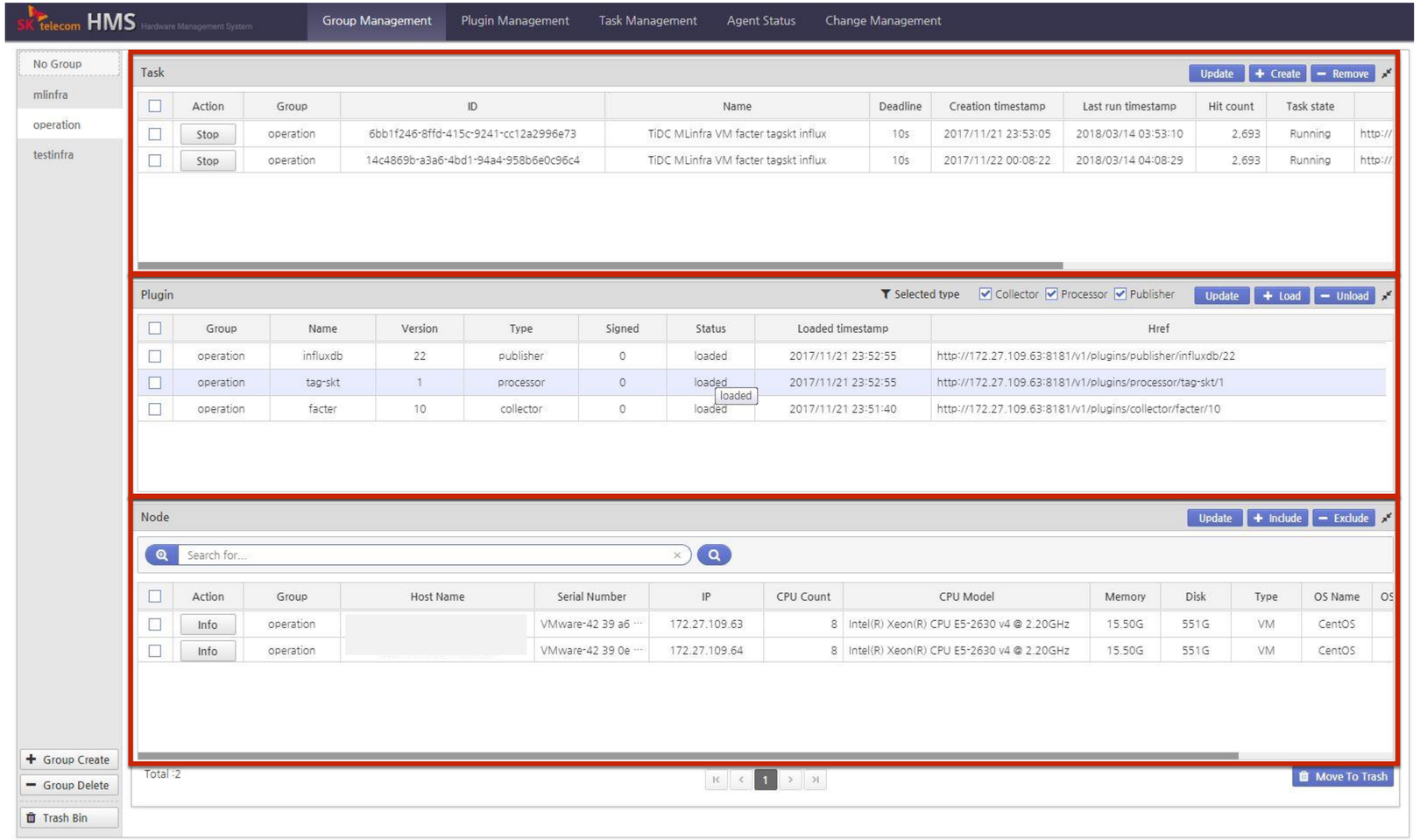
Cluster Stats

Group List

Node List

Detailed Node Info

HMS – Group Management

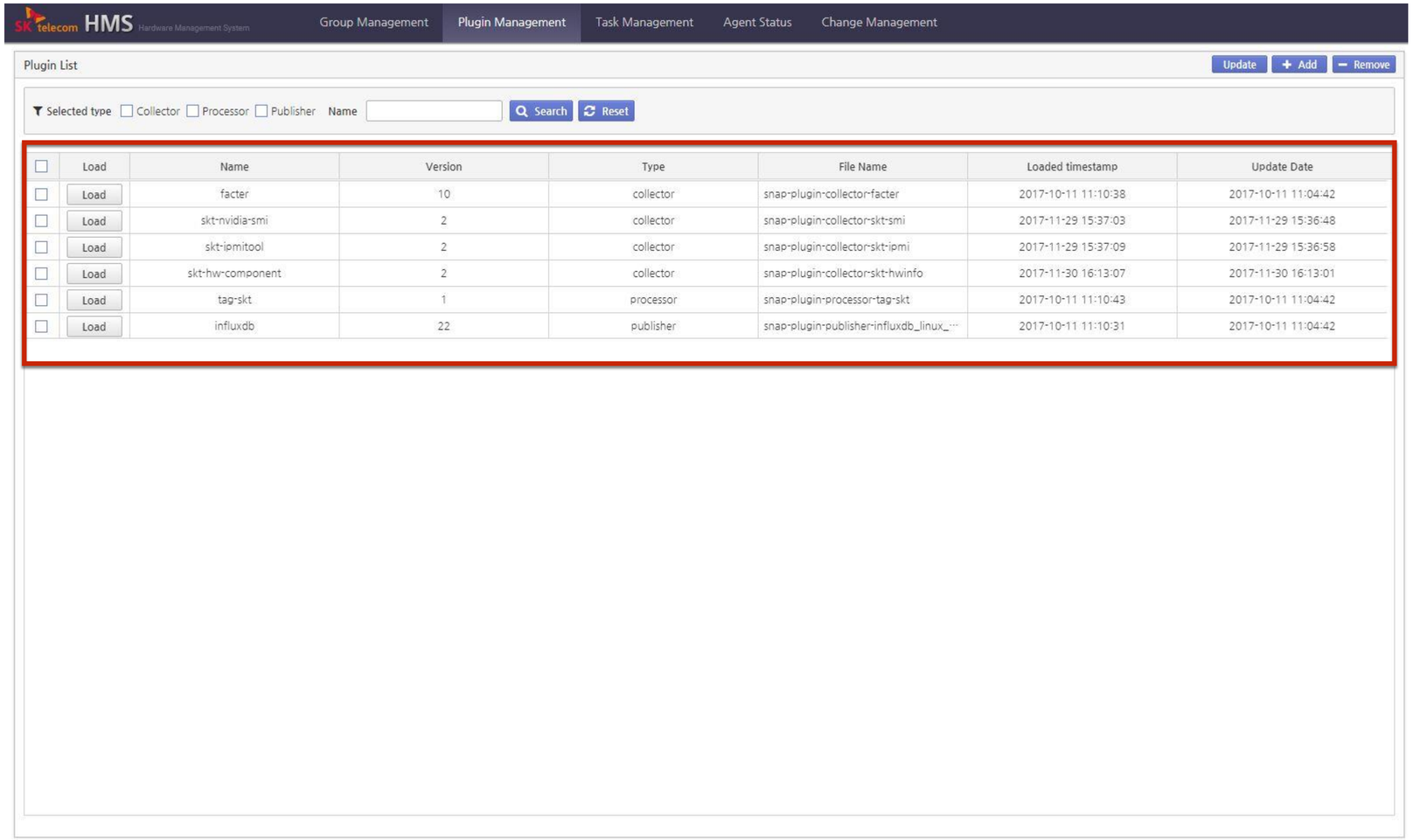


Task Management

Plugin Management

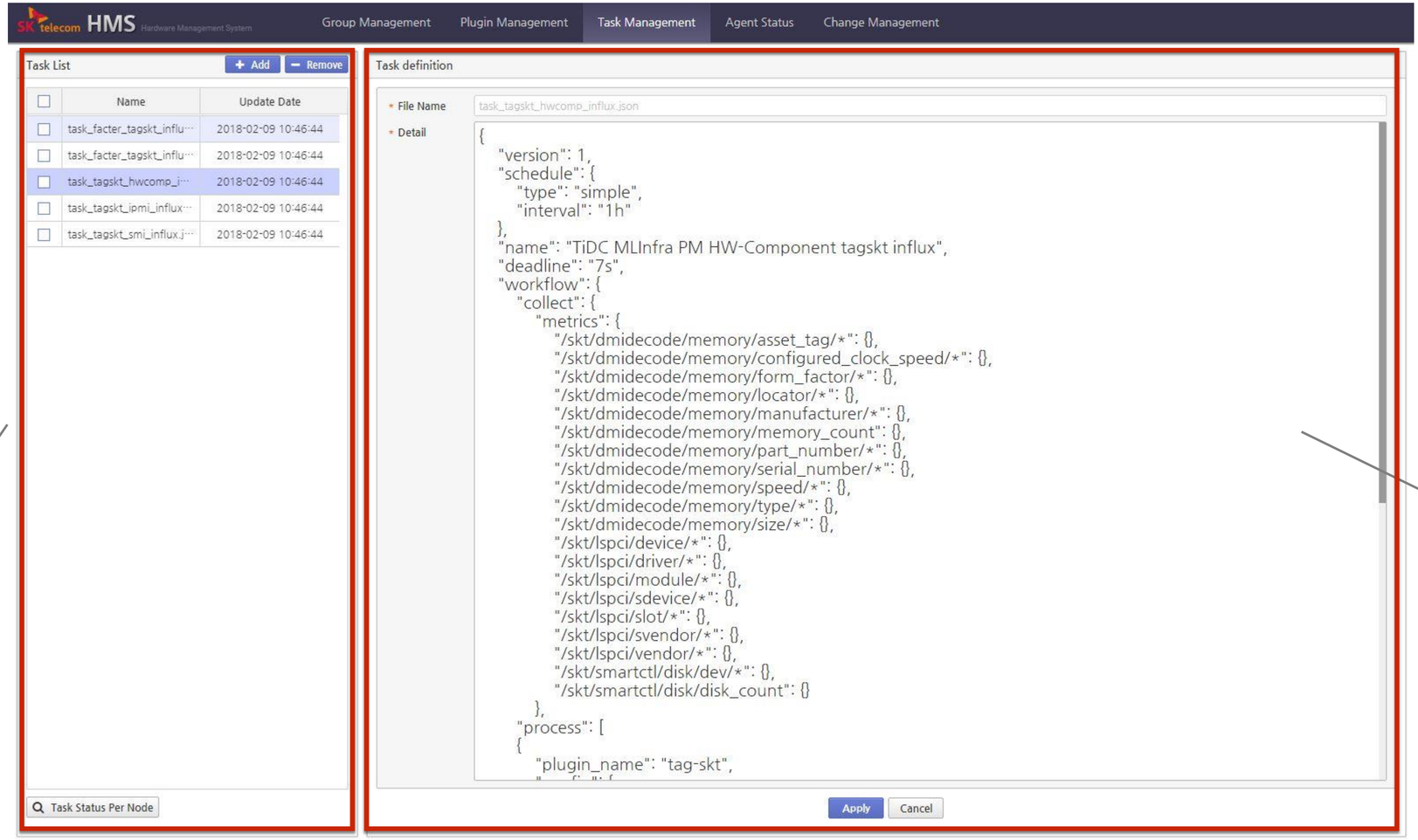
Node Management

HMS – Plugin Management



Plugin List

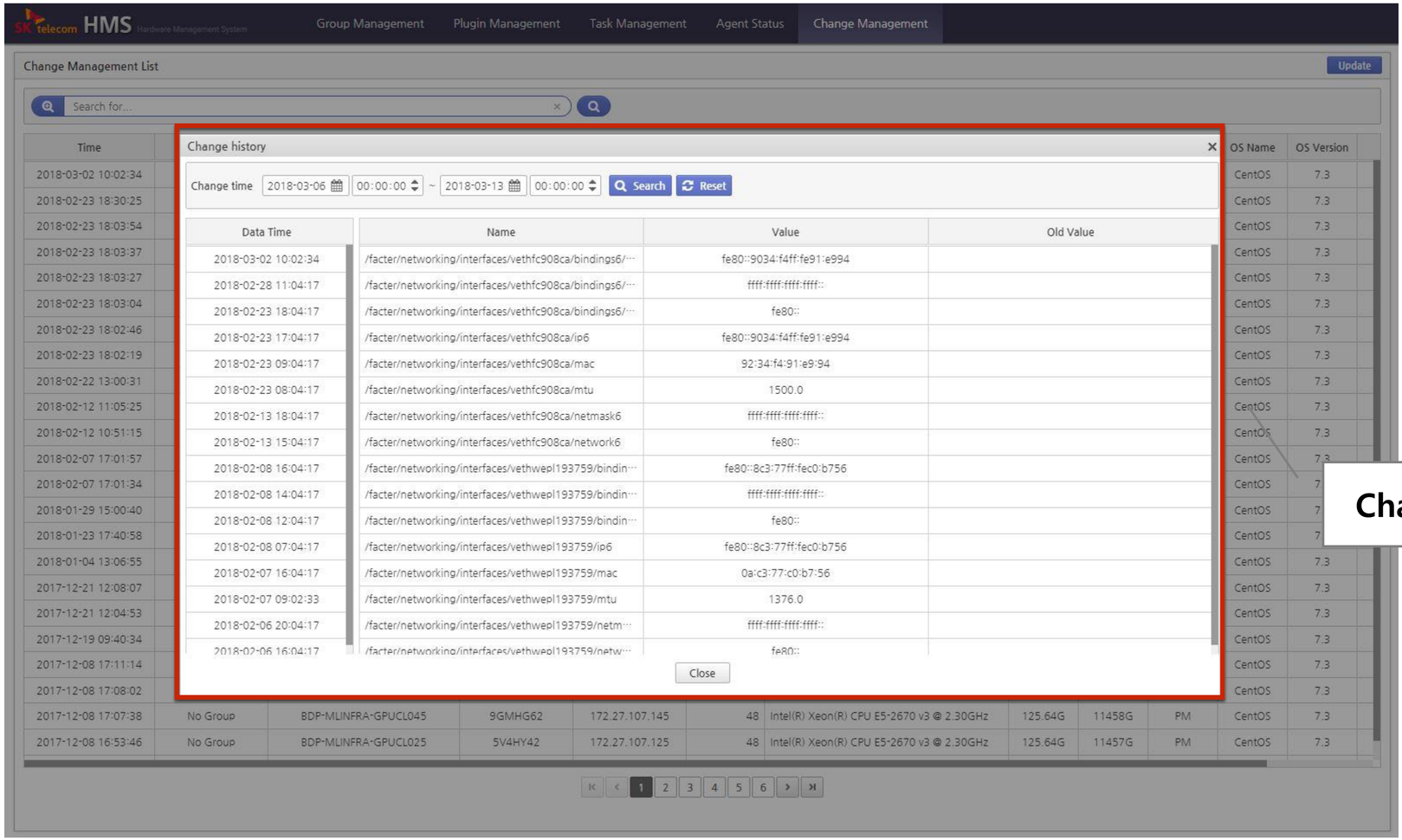
HMS – Task Management



File List

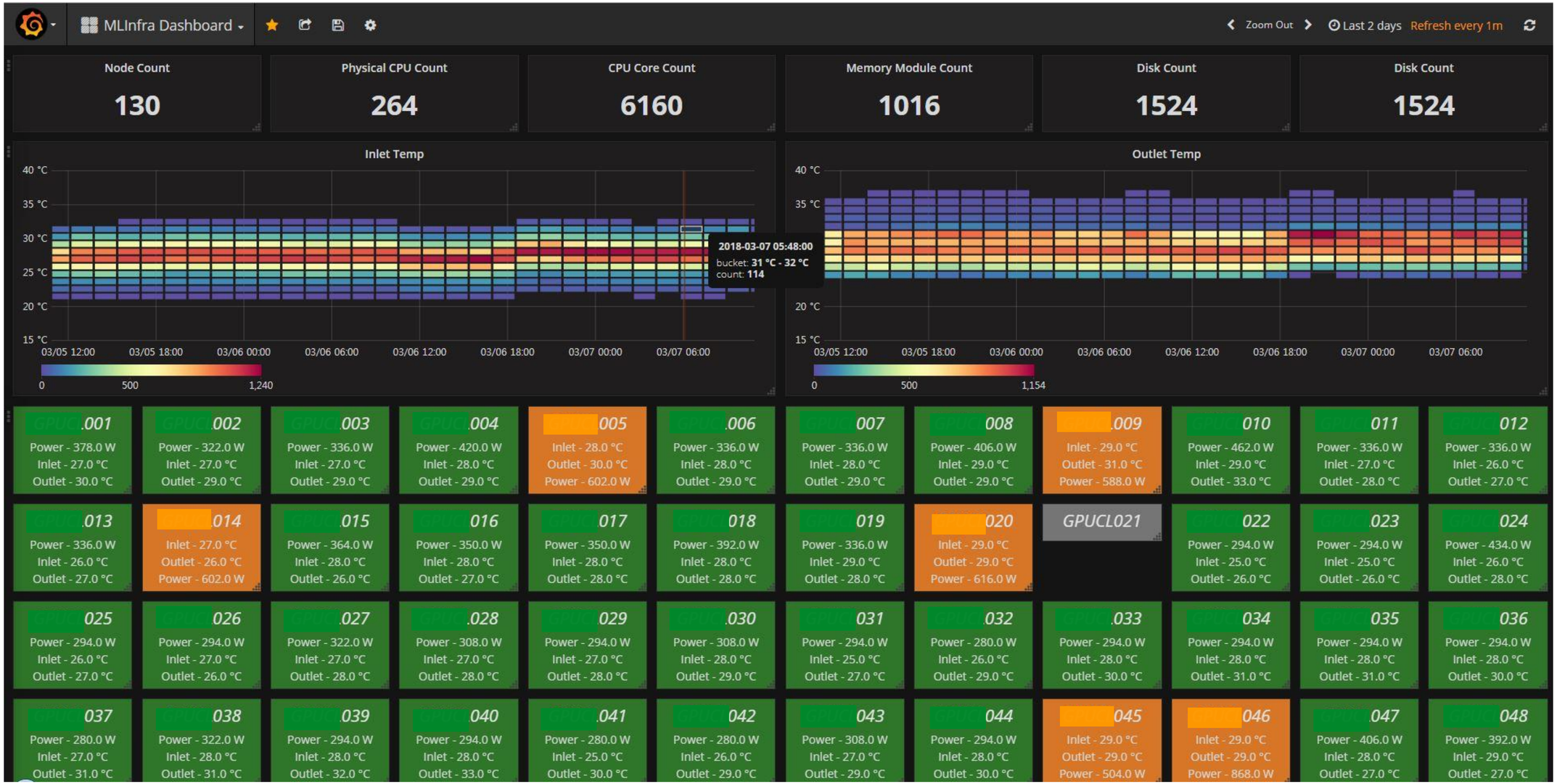
Task Editor

HMS – Change Management



Change History

Dashboard - Grafana



Dashboard - Detailed Node View

Dashboard – Detailed Node View (GPU Info)

3DV/HMS Integration Demo

hms_3dv_demo.mp4

Future Work

- Support for Multiple Rooms (Data Centers)
- NFV & MEC Integration
- Complete Next Generation Hardware Management Protocol support (RedFish, OpenConfig etc.)
- Expand Data Coverage (ex. Switch, Enterprise Storage)
- Integration with Facility Management System (FMS)
- Open sourcing developed plugins

Thank you

email: jungsoo.kim@sk.com

- SK Telecom Upcoming Talk:

✓ Date: Wednesday March 21, 2018 11:00am - 11:30am

✓ Venue: 210 C (EW: Storage)

✓ Subject: SK Telecom: Shareable DAS Pool with All NVMe Array (Eric H. Chang)

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