

# GFS CRANE DCIM PRODUCT OVERVIEW



Managing Data Center's Competing Demands



### Introduction:

Modern Data Center Managers face the problem of competing demands. For instance, an important KRA for the Data Center (DC) Manager is maintaining the highest levels of uptime throughout the year, 24x7. At the same time, for keeping capital costs under control, maintaining high asset utilization is also a KRA. However, uptime has an inverse relationship with asset utilization. The higher the uptime, more the required redundancies: n+1, n+2, even n+n; this results in ever increasing numbers of backup devices of every category, leading to the obvious outcome of lower asset utilization.

Another KRA for the DC Manager is maintaining a consistent temperature range in the server halls. However, maintaining low

# PUE (Power Usage Effectiveness)

PUE is a measure of Data Center energy efficiency, proposed by The Green Grid. PUE is defined as a ratio of Total (Facility + IT) Power Consumption to Total (IT) Power Consumption, ideal being 1.0.

Higher the PUE, lower the energy efficiency. It's reciprocal, DCiE (Data Center infrastructure Efficiency) is expressed in percentage.

temperatures require extra cooling, leading to Higher Facility Power Consumption. Higher Facility Power Consumption leads to higher PUE, contrary to a very important KRA for the DC Manager. Maintaining low temperature as well as achieving lower PUE is a classic conundrum for the Data Center Manager.

Rack space utilization versus uptime and operational security is another example of competing demands. Packing more servers in a rack not only increases the possibility of power trip, adversely impacting uptime of affected servers, but also compounds the risk of sharp temperature rise in the Rack, which could lead to the risk of fire hazards, thereby undermining the safety and reliability of the data center and its devices. Higher Rack Space Utilization, a KRA, is a competing demand to the two KRAs of operational security of the data center as well as to higher server uptime.

As if competing demands are not enough, there is an added dimension of constraints. We wish to achieve high rack space utilization while blocking and reserving U-spaces. We wish to pack in more servers in the rack but also make sure we do not exceed the allocated power cap on it.

GFS Crane DCIM addresses the new age Data Center Managers' conundrums of competing demands and constraints through a complete, integrated and multiple-edition software of operations, planning and management for Enterprise and Colocation Data Centers, irrespective of their size.

# Scalable Editions of GFS Crane DCIM:

#### **Standard Edition:**

While Data Center facilities vary in size, they all have two fundamental requirements for Infrastructure Management: maintaining high uptime and improving asset utilization. A small facility with 5-19 Racks typically requires only two DCIM functions: critical infrastructure Monitoring with timely Alerts, and basic Asset Management. Our GFS Crane DCIM Standard Edition is the best-suited product for these smaller Data Centers.

#### **Advanced Edition:**

For Enterprise Data Centers with 20 or more racks, requirements build up. Beyond asset utilization, resource management like power, space and cooling come into the equation. Data Centers with 100s (or even 1000s of Racks) across multiple halls, floors and buildings now need Change Management. More complex Data Centers with Primary and Secondary facilities need their DCIM to have High Availability. They need integration with Building Management Systems (BMS) and 3rd party applications. The answer to these multiple and complex requirements is our GFS Crane DCIM Advanced Edition, a complete and an integrated product for critical infrastructure management.

#### Colo Edition:

Colocation Data Centers require multi-tenancy and customer management.

- Multi-tenancy: Hosting multiple customers with dedicated racks, cages or complete floors, Colo DCs need to offer them separate secure portals of their dedicated space in a single-instance DCIM.
- Customer Management: Colo DCs want to know from their DCIM actual power usage by each customer versus their contracted power. They want their DCIM to provide month-end SLA reports for each customer.



They want their DCIM to enable faster customer on-boarding.

GFS Crane DCIM Colo Edition offers (a) secure Multitenancy with option to provide dedicated Customer portals, (b) customer-wise Power Use and Billing, (c) alerts when any SLA provisions are breached, and (d) month-end SLA reports. The Colo Edition covers all features of Advanced Edition, including tight integration with BMS.

# Technology:

The advantages of GFS Crane are greatly enhanced due to its robust underlying technology. Powered by Industrial IoT, it is built using JAVA Enterprise Edition with 3-Tier architecture, and 100% web-enablement. This enables support of multiple Data Centers through a single instance DCIM.

Near fail-safe operations is made possible through parallel DCIM Servers, offered as High Availability Option with Advanced and Colo Editions. Multi-threading enables scalability within each Edition.

To meet demands of rapid deployment, GFS Crane DCIM is delivered as a software appliance. Built with robust technology and scalable architecture, GFS Crane assures:

- Quick installation in both Linux and Windows - VMs or physical servers
- ↓ Support of multiple DCs in a private Cloud
- Scalability to support 1000s of devices with rapid monitoring.
- ➡ High Availability with 99+% Uptime.
- Multi-tenancy with high data security.

Besides multi-protocol support, GFS Crane DCIM has APIs that allow integration with 3rd party applications. Its ability for deployment on Private Cloud, enables it to be used for Remote Management of Data Centers.

# Monitoring, Alerts & Controls:

Near real-time monitoring of devices and sensors, coupled with generation of alerts when threshold levels of critical parameters are breached, are crucial to de-Risking of a Data Center.

Monitoring of devices is also necessary to enhance their longevity and performance. BMS and DCIMs have automated this vital aspect, which was once a labour-intensive job prone to errors - leading to expensive device, and even Data Center outages.

Monitoring power equipment (including generating sets), HVAC, temperature, humidity and air quality sensors prevent environmental hazards like power trips, rack fire, and device corrosion which could hinder uptime and device health.

Maintaining High Performance and Improved Uptime while ensuring Safety and Reliability of a Data Center is a near real-time job. GFS Crane DCIM does this through:

#### a) Monitoring:

- Monitoring of Devices and sensors over SNMP, BACnet/IP and MODBUS/TCP. Dry Contact Devices are monitored using PLCs.
- ← Critical infrastructure parameters, captured from monitoring, are displayed on a Widget-Based Dashboard.

#### b) Alarms:

- ← Alarms, based on threshold level breaches, can be Set-Up for Current, Voltage, Temperature and other parameters for critical infrastructure.
- ↓ Alarms can be configured into modes like Critical, Non-Critical and Warning. Besides snooze-time, Binary & N-ary alarms can also be set.

#### c) Controls:

iPDU Socket Binding & Control: for Rack devices with two power sockets served by a pair of iPDUs. In GFS Crane DCIM, we can pair corresponding iPDU sockets attached to a particular device so that it can be switched OFF in case of hazard. Then switched ON when the situation returns to normal.



Fuel Level Automation, Air Quality Control, and Air Handling Unit (AHU) Control are supported by GFS Crane DCIM. Event status reports are retained for analysis.

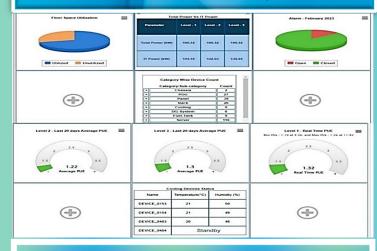
Analysis of monitored data generates KPIs such as PUE, trend graphs like phase-wise UPS load, and visual representations like thermal maps. These appear on a widget-based Dashboard. Monitoring Device health & performance using the Dashboard plays a key role in maintaining Data Center Uptime.

#### Manage Using Dashboard

GFS Crane DCIM provides a widget-based dashboard that shows at a glance Data Center performance through KPIs such as (a) PUE: Levels 1,2 & 3; (b) Rack and Floor space utilization; (c) Open versus Closed Alarms; and (d) device uptime versus SLA standards.

Besides KPIs, the dashboard provides graphical representation of the Number of Provisioned Assets, CO<sub>2</sub> footprint of the server halls, Total Power Vs IT Power and average temperature in cold and hot aisles.

Dashboard widgets can be customized, and more widgets can be added based on specific customer requirements. The KPIs and graphs in the widgets are useful guides for making changes and contingency plans if course corrections are needed in DC operations.



GFS Crane DCIM Dashboard

### **Asset Management:**

Data Centers own expensive equipment. From governance point of view, we need to account for each of them. From operational angle, assets need to be in perfect working conditions for availability, performance and longevity.

We must have ready answers to questions like what are the makes of each IT and Facility device, which devices are provisioned, what are their locations and who owns them. Built-in Search function in Asset Management along with floor layout and rack elevation of populated devices provide such answers. Inter-dependencies between devices, defined in Asset Relationship Map (ARM), are crucial to identify root cause of a fault. A Data Center Manager relies on DCIM to keep track of all assets under his custody to maximize device uptime, performance and longevity.

<u>Uptime</u>: Each device has defined uptime in a Service Level Agreement (SLA). Adherence to preventive maintenance (PM) schedules is vital for this. While maintaining PM schedules in DCIM, the DC Manager can also check the ARM and the Power Chain for potential downstream impact when a device is taken out for PM. This detailed information of devices in the DCIM, helps contingency planning when undertaking scheduled maintenance. Device uptime reports are generated which can be scheduled for email delivery to concerned stakeholders.

<u>Performance:</u> History of an asset's breakdowns and it's track record in delivering desired outcomes in the DCIM provides analysis of device performance with trend charts.

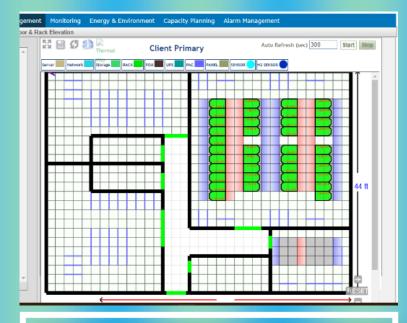
Longevity: The life of each category, or its replacement period, is defined in the DCIM's Policy section. This helps the DC Manager to maintain an asset through its expected life with desired uptime and performance. And make timely replacement.

From governance perspective, audit trails of Move-Add-Change (MAC) operations must be maintained. In GFS Crane DCIM the Workflow - from requisitioning to provisioning



with multi-level approval and work order generation - maintains a history of all changes. Key features of the GFS Crane Asset Management are as follows:

- ➡ Built-in OEM Library: used for populating Asset Inventory. Eliminates manual entry; saves time, effort and minimizes human errors.
- Asset Relationship Map (ARM) chart: provides inter-relationships between each pair of connected devices. This helps in quickly identifying root cause of a failure.
- ↓ Uptime and SLA Reports for critical devices that impact DC Uptime.
- PM scheduling with Alerts to ensure good upkeep and minimize breakdowns of infrastructure.
- A workflow-based approval system for MAC prevents ad hoc provisioning. Keeps log of all MAC operations that can be used as audit trails.



Floor Elevation: 2D



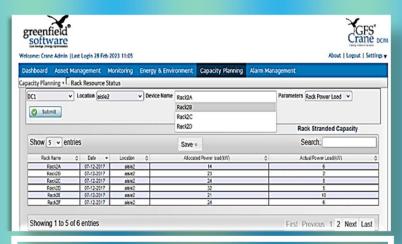
### **Capacity Planning:**

A Data Center is a large capital investment based on an expected Return on Investment. Stranded Capacity in Data Centers, a common occurrence, is an example of wasted capacity. It can be visualised as fragmentation of resources. Each rack device has certain Power, Space and Cooling requirements. While rack#1 could have available power, it may not have the required contiguous U-space available to accommodate a new server; on the other hand, rack#2 may have the contiguous U-space but is short on required power. GFS Crane DCIM resolves this issue through generation of Stranded Capacity Reports that identify the fragmented usage of rack capacities. Reallocation of devices generates latent available capacity and deferring further investment.

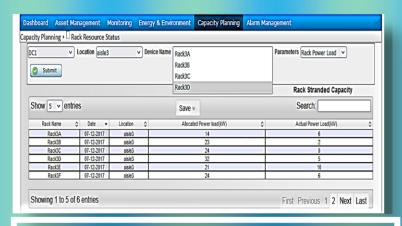
GFS Crane DCIM offers Capacity Planning Module with "What-if" Analysis for adding or removing future assets.

**Key features of GFS Crane Capacity Planning:** 

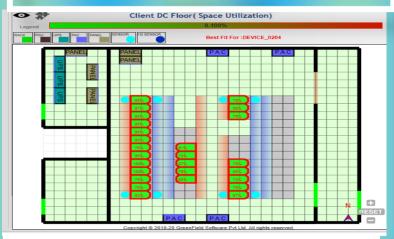
- Inventory Management through tracking of allocated versus used and remaining resources.
- Identifies which Racks may have contiguous U-space when provisioning new Servers using the MAC Workflow
- Rack elevation modeling to forecast power, space & cooling needs with use of OEM Library
- Identifies best-fit Rack for new assets based on available capacities.
- ↓ 2D & 3D Visualization of space, power & temperature
- Impact Analysis: in conjunction with Power Chain, Capacity Planning can trace downstream impact if a UPS fails, or an upstream impact if more racks or devices are added.



Stranded Capacity: Available U-space Space But no Remaining Power in Racks



# Stranded Capacity: Available Power But no Remaining U-space in Racks



**Best Fit Rack for Device** 



### **Power Management:**

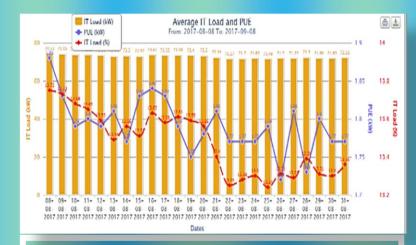
Data Centers are energy-intensive due to Servers consuming massive power and getting overheated. Hence facilities require cooling. But HVAC are energy guzzlers themselves. Power Usage Effectiveness (PUE), described in Introduction section of this Paper, measures this Total Load versus IT Load as a ratio.

Forty percent of a Data Center's operating expenditure is energy costs. Efficient power use could lead to significant savings. One ROI (return on investment) from DCIM investment comes through OPEX savings on power costs as GFS Crane DCIM's Power Management measures the PUE. This, along with Environment Management, described in next section, shows ways and means to optimize cooling.

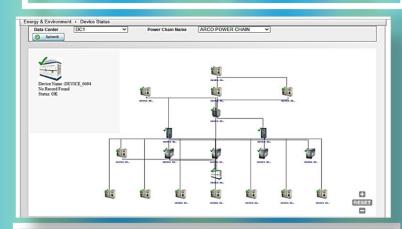
Another ROI comes from reduced power outage on a rack. GFS Crane DCIM Power Management tracks permissible power available for a rack before adding new devices on it. Branch circuit and iPDU socket level power monitoring helps maintain reliability and safety for each rack, and devices populated in them. Monitoring Phasewise Current and Voltage helps prevent power outages or rack fires caused by electricity flow beyond permissible limits or overheating. All this is displayed in the Power Chain, a chart showing electricity flow from transformers through all downstream devices up to each Rack. Key Features of the Power Management Module are:

- Power Chain: updated regularly on device status with alert display.
- Deriving customer-specific power use
- Branch circuit monitoring
- Rack iPDU monitoring up to socket level

- Live data reports on Power utilized per customer Rack (or at cage level).
- ♣ PUE & DCiE reports to support SLA
- Multi-levels (1,2,3) of PUE on a widgetbased dashboard



# IT Load & PUE: 30-day average



**Power Chain** 





## **Environment Management:**

Besides regulating temperatures, it is important to monitor concentrations of humidity, gases and various chemicals in server halls. Unchecked concentration can lead to serious consequences. Data centers in urban locations have reported failures of servers and storage systems caused by sulfur concentrations. High levels of humidity or H<sub>2</sub> could lead to sparks and fire. Toxic gases must be within statutory health safety levels.

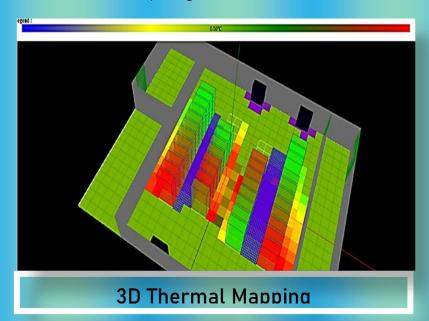
Sustainability management has also become important in modern Data Center operations. Scope 2 carbon emissions in Data Centers, arising out of power use by servers and cooling, are now included in most companies quarterly and annual financial returns.

For any Data center, the standard practice is to install Temperature and Humidity sensors across the White space area, to closely monitor temperature and humidity in and around the IT Racks. To detect fire at incipient stages, smoke detectors are installed. To detect the presence of water (due to condensation or leaks), water leak sensors are installed. Additionally, to detect the concentration of harmful gases like H<sub>2</sub>, SO<sub>2</sub>, H<sub>2</sub>S, and CO, air quality sensors are deployed within the Data Center.

HVAC devices and environmental sensors are monitored 24 x 7 by GFS Crane DCIM to maintain regulated temperature, humidity, and clean indoor air quality within the Datacenter facility. GFS Crane DCIM raises alerts when internal air quality deteriorates beyond set thresholds. These alerts serve as notifications that it is time for repairs or of the HVAC system's chemical filters, controlling temperatures or blowing out toxic gases.

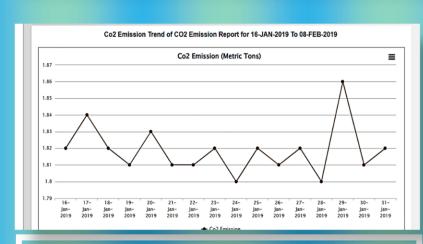
GFS Crane DCIM provides 2D & 3D Color coded thermal maps of various aisles and floors for easy visualization to detect which parameter, and which area, requires change to maintain optimal conditions from SLA, technical and cost considerations. Finally,

GFS Crane DCIM provides both Air Quality and Emission Reporting.





# **Cooling Device Status**



CO<sub>2</sub> Emission Graph



#### Conclusion:

GFS Crane DCIM is a complete and integrated solution that comes with all the necessary features in a single product. This allows DC Managers to derive multiple use cases from one DCIM solution, removing the complexity of managing different products for different DC needs. GFS Crane DCIM comes in three different Editions that provides more flexibility to customers for making choices as per their requirements. GFS Crane DCIM is modular and scalable.

Customers can start with lower editions and progress towards higher editions, or license additional modules, as their business grows. All customers expect some customizations. Both GFS and our DCIM (architecturally) are flexible for developing customizations. This results in faster implementations, lower costs and higher ROI.

De-risking DCs from fire or other environmental hazards, preventing power outages & ensuring high availability is the primary job of GFS Crane DCIM. CAPEX and OPEX gets significantly reduced due to monitoring of device health and enhancing device Longevity via SLA Reports. DC Monitoring, Planning and Management becomes much easier with GFS Crane DCIM. Finally, GFS Crane DCIM, with a 360° view of all critical infrastructure and resources, helps the Data Center Manager navigate through the complex web of competing demands to deliver desired SLA results and business benefits to its users.



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