Data Center Infrastructure Solutions for Virtualization
Data center managers have turned to virtualization to drive down capital and operating costs while increasing capacity. Yet, achieving the promises of virtualization requires addressing new challenges in data center capacity planning, application and server management and power and cooling optimization.

Typically, data centers are managed by different people using disparate applications and controls, which are not easily integrated and prevent data center personnel from gaining a holistic view of the infrastructure. This makes it difficult to accurately plan and effectively manage data center capacity, efficiency and optimization.

**A better approach for optimizing the virtualization infrastructure is utilizing a unified management approach that allows managers to gain a holistic view of virtual and physical servers and the physical infrastructure that supports them. They can then act upon this information to properly match capacities and control the operation of physical infrastructure for efficiency and availability.**

Solutions from Emerson Network Power make this approach possible and ensure your virtualized environment is always prepared for what’s next. We improve the availability and access of all IT and infrastructure assets and make the data center environment more efficient and easier to manage and control.
Risks of an Inadequate Infrastructure

Most data centers are being managed in layers. Application, IT and physical systems are managed separately, often by different people, resulting in gaps in visibility, access and control.

These gaps are made even more severe by virtualization, as managers must access and manage multiple applications across multiple physical and virtual servers.

And the same gaps can translate into significant risks if you virtualize without a comprehensive approach for how you plan, deploy and manage your critical infrastructure:

- Even in virtualized data centers, utilization of virtual assets remain below 25% for large parts of the day.*
- More than 40% of data center managers say monitoring and management is a key challenge after they virtualize, according to Emerson research.
- The lack of real-time visibility into the health and capacity of physical and virtualized assets will force managers to estimate utilization, resulting in over or under provisioning of resources.
- Too much power or cooling capacity will lead to oversized safety buffers and lost efficiency; too little will compromise availability.
- Virtualization will drive up rack densities and change the thermal dynamic - effective power and cooling strategies must address this and minimize future growth pains.

* McKinsey & Company “Revolutionizing Data Center Efficiency”
To ensure a responsive infrastructure for virtualization, focus on:

1. **Obtaining a consolidated view of all physical and virtual machines** and their real-time performance so you can better understand how much capacity exists and where it can be utilized.

2. **Scaling power and cooling to align infrastructure capacity and server growth**, thereby eliminating undersized or oversized power or cooling, reducing or delaying capital expenditures and improving operational efficiency.

3. **Accessing the historic performance of your equipment** so when you bring virtual machines on line you know the optimal location based on current loads and historical power and cooling fluctuations.

4. **Controlling and differentiating access** to physical and virtual servers for compliance with IT security requirements.

5. **Properly modulating and controlling of power and cooling capacity in real-time** in response to moves, adds and changes to optimize operational efficiency and availability.

6. **Ensuring continued or improved levels of performance of the data center** through real-time monitoring and management and cost-effective infrastructure support and maintenance.

“As the customer’s demands are changing, the data center is dynamically reacting ... only delivering the resources as they’re needed, where they’re needed, and then as the load diminishes, the units are in turn reducing their power consumption”

– Gordon Scherer, president of DataCenter.BZ
Emerson Network Power infrastructure solutions deliver what you need to ensure the promises of virtualization, while avoiding the risks.

We provide integrated visibility, access and management of the IT, application and physical infrastructure layers. You can see what is happening, decide what to do and take action that resolves issues and improves performance – all from a unified interface. These solutions facilitate managing virtual and physical assets, from provisioning to production and decommissioning.

Using our solutions, you can achieve:

- **Higher utilization of IT** and physical infrastructure to improve efficiency and productivity of existing resources and avoid the cost of adding capacity before it is needed.
- **Faster, simpler deployment of IT equipment and physical infrastructure** at less cost and risk.
- **Improved performance and reliability** with real-time monitoring, diagnosis and management.
- **Lower operating costs** through reduced equipment failure rates and reduced time to repair.

No matter where you are in your virtualization efforts, Emerson Network Power can help prepare your infrastructure for the challenge. Our solutions can be implemented incrementally, scaled to the size of the data center and managed locally or remotely.

### What does optimized virtualization infrastructure look like throughout the data center lifecycle?

#### Planning, Design and Deployment

Gain a consolidated view of data and every data center device – both virtual and physical – so you can reduce capital expenditures compared to conventional approaches and design for optimized server, power and cooling capacity, availability, and efficiency at rack and room levels.

#### Operations and Maintenance

Manage power and cooling capacity to match loads as they change. Control and monitor servers and critical infrastructure in real time, improving energy efficiency by 30% and operational efficiency by 70%, by optimizing power and cooling capacities and automating previous manual monitoring and management activities.

#### Monitoring and Management

Utilize real-time modeling for data center changes and to dynamically monitor and control available server capacity, power usage, air temperature and airflow as you manage today and plan for the future.
Using Emerson Network Power solutions, you get powerful interoperability between power, cooling and IT infrastructure – plus managing and control capabilities – which makes unifying the IT, application and physical layers of the data center easy and effective.

**A Unified Approach to Data Center Management**

**Data Center Infrastructure Management: See, Decide, Act**

To enable a unified approach, Emerson Network Power Solutions provide a single, consolidated dynamic platform for monitoring and controlling servers and intelligent infrastructure in the virtualized data center.

New technologies for data center infrastructure management (DCIM) from Emerson Network Power offer data center managers the visibility and control they require to predict the demand on physical systems and make decisions to ensure they are operating at peak performance. These solutions help you manage capacity, plan moves, adds and changes, enforce authorization levels, visualize configurations, analyze energy usage and account for the impact of virtualization on physical infrastructure.

These highly scalable DCIM technologies enable you to see what is happening in real-time - and react instantly - to maintain efficiency and prevent downtime. And you can better utilize and plan data center growth based on current and future capacity requirements.

These solutions help you:

- Quickly determine the optimal location for devices to be placed or moved through intelligent asset placement.
- Match the available resources with the device requirements, then calculate the impact of the placement on underlying resources - ensuring that capacity thresholds will not be exceeded.
- Navigate from the power infrastructure to applications through the virtual layer to reduce mean time to repair.
- Improve capacity management through the identification of previously hidden resource consumers.
- Recover capital expenses by converging infrastructure purchases into fewer multi-purpose devices—up to 75% saved on rack space.
- Reduce operational expenses by reducing the energy required by powering fewer devices—up to 30% less usage.
- Lower risk of unauthorized access or misuse of critical systems by maintaining one centralized secure platform as opposed to multiple point products with varying degrees of security coverage.

“We had a vision of administering server systems from anywhere and to anywhere in the world—through a single interface. We’re operating more efficiently. We’re able to do more with less.”

- James Armstrong, Senior Infrastructure and Data Center Management, SAP
Intelligent Infrastructure

Maintaining balance between capacity, availability and efficiency is crucial with virtualization.

You need enough capacity to prevent downtime – so that even at full load, you have what you need. At the same time, with too much capacity, you face unutilized resources and cost-raising inefficiency.

It comes down to this: you have to be able to modulate power and cooling as the load changes. You need to be able to shift capacity to where the load is at or, even better, will be.

Anything less than that, and you risk losing availability or efficiency.

Power and Precision Cooling

Emerson Network Power solutions for power and cooling provide the industry’s highest levels of availability, efficiency and control. To do this, Emerson Network Power uses new designs in power systems that allow peak efficiencies to be achieved even at 40% of full load. And precision cooling technologies match air temperature and air flow to changes in server and rack temperatures and deliver higher efficiency at reduced loads.

These solutions provide:

- Metering and control of power at the rack PDU receptacle level to ensure adequate power as rack capacities change.
- Energy optimization through different UPS operating modes for up to 97% efficiency at full load.
- High-efficiency precision cooling system compressors and fans that can reduce energy usage by 30%.
- Integrated intelligent controls that maximize teamwork and load sharing between cooling units for a unified cooling environment that can improve efficiency by up to 40%.
- Aisle containment systems and integrated intelligent solutions that accommodate higher densities and reduce energy consumption.

Critical Space Services

Virtualization places a number of complex and unique challenges on the data center. Having a knowledgeable strategic partner in-market can help you face these challenges successfully.

Emerson Network Power’s data center infrastructure experts are available to ensure your data center is reliable, efficient and always prepared for what’s next. With extensive experience in data center infrastructure, these individuals resolve critical challenges using holistic data center best practices and advanced technologies and services. They remove the uncertainties in configuring, installing, servicing, and supporting infrastructure solutions, providing customers with greater peace of mind now and into the future.

“Through advanced control technologies, Emerson Network Power has demonstrated as much as a 79% decrease in power usage.”

– Emerson Network Power Whitepaper: Using Virtualization and Digital Control Technologies to Increase Data Center Operating Efficiency
A Unified Approach to Data Center Management
| **Data Center Infrastructure Management (DCIM)** | **High-efficiency Precision Cooling** |
|------------------------------------------------|--|---|
| Incrementally deploy DCIM appliances and software as you need it: | Liebert DSE™ Industry’s most efficient DX system using advanced fan and compressor technologies. |
| ■ Avocent® Data Center Planner™ Unmatched visualization, insight and management capabilities. | ■ Liebert CRV™ Highly scalable and efficient row-based system. |
| ■ Avocent Advanced Console Server™ Remote device monitoring, diagnosis and troubleshooting. | ■ Liebert iCOM™ Controls Manages airflow and temperature across multiple precision cooling devices to ensure an optimal environment. |
| ■ Avocent MergePoint Unity® KVM Over IP Appliance Complete remote monitoring for data centers and branch offices. | |
| ■ Avocent DSView 4 Secure, out-of-band, centralized management of all connected IT and network devices. | |
| ■ Liebert SiteScan Oversight of Liebert precision air, power and UPS units, and many other devices. | |
| | Deploy enterprise-level DCIM appliances and software to manage large data centers and remote locations: |
| ■ Liebert SiteScan | |
| ■ Avocent Universal Management Gateway™ Comprehensive access and control of all devices. Real-time data collection makes it easy to scale. | |
| ■ The Trellis™ Platform Real-time infrastructure optimization. Modular architecture lets you add functionality incrementally. | |
| Avocent Data Center Planner, Avocent DSView 4 or Liebert SiteScan represent fiscally responsible building blocks for migrating to the Trellis Platform. | |

<table>
<thead>
<tr>
<th><strong>Efficient, Scalable AC Power and UPS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Liebert NXL™ Enterprise-level availability and efficiency.</td>
</tr>
<tr>
<td>Liebert NX™ Transformer-free, cost-effective, and efficient power protection.</td>
</tr>
<tr>
<td>Liebert APM™ Row-based, easily scalable UPS system.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rack Power Management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Liebert® MPH™ PDU Cost-effective system for metering power usage at the receptacle level.</td>
</tr>
<tr>
<td>Liebert MPX™ PDU Modular system for metering and control of power at the receptacle level.</td>
</tr>
</tbody>
</table>
Key Use Cases: Everyday Benefits of Emerson Network Power Virtualization Solutions

Planning, Design and Deployment

**Challenge:**
Determining where to deploy virtual servers is challenging without an accurate inventory of assets and performance data for servers and physical infrastructure. Understanding the impact that moves, adds and changes or large scale build-outs can have on the infrastructure is critical for maximizing efficiency and ensuring availability.

**Solution:**
With the right technology, tasks that were once complicated, such as determining the optimal location for new servers or the impact of changes to infrastructure capacity, are simplified and can be completed up to 70% faster.

By combining DCIM technology with intelligent power and cooling solutions and servers, data center managers can easily maintain detailed asset inventories and repositories of performance data - optimize capacity allocation, availability and efficiency.

70% FASTER

Tasks that were once complicated can be completed up to 70% faster

Operations and Maintenance

**Challenge:**
In many virtual environments, application layers and IT layers are dynamic, but critical infrastructure is still managed for static capacity and often under- or over-sized. This leads to risks in availability and efficiency.

**Solution:**
DCIM solutions of both hardware and software engineered together create the real-time information and control required to manage the virtual environment. This data is displayed via the software over time, enabling precise workload management and the ability to anticipate and resolve potential problems.

Power usage can be precisely managed in the virtual environment to reduce downtime risks when capacity is added. Energy consumption and costs can be tracked and trended at equipment, rack and room levels. Environmental sensors monitor rack conditions and communicate with precision cooling controls to adjust airflow and temperature for load changes, resulting in energy savings of up to 30%.

70% FASTER

SAVINGS OF UP TO 30%

Advanced cooling controls can generate energy savings of up to 30%
**Planned Maintenance**

**Challenge:**
Preparing for maintenance can risk redundancy or availability without a complete view of data center assets and their dependencies.

**Solution:**
Routine maintenance becomes easier and less likely to impact server availability when DCIM software and intelligent infrastructure are in place. DCIM gives you 100% visibility into IT, application and infrastructure availability risks before maintenance times by showing connections and dependencies. This lets you validate that redundancy and capacity required for the movement of virtual machines and suppress alarms until maintenance is completed.

**100% VISIBILITY**
DCIM provides 100% visibility into IT, application and infrastructure availability.

---

**Reducing Mean-Time-To-Repair (MTTR)**

**Challenge:**
Downtime causes can be difficult to isolate in the more dynamic virtualized environment, costing thousands or even millions of dollars. What may look to a network administrator like an application being unavailable could actually be a UPS outage when asset dependencies cannot be viewed. These disruptions take more time to resolve and become costly to the company.

**Solution:**
DCIM software and appliances reduce MTTR during unplanned outages. One Emerson Network Power financial services customer estimated that using DCIM to locate a recent equipment breakdown could have speeded discovery time by seven-fold, reducing its outage time from 3.5 hours to 30 minutes and saving it more than $4 million in downtime costs. The software maps the entire data center physical and virtual environment and relationships between applications, IT devices and physical infrastructure. Administrators can locally or remotely view graphical representations of where an alarm is being triggered, allowing staff to go directly to the source of the alarm, isolate the root cause and immediately understand how it impacts the downstream devices.

**SAVE MILLIONS**
DCIM can save millions of dollars in downtime costs through faster location of equipment breakdowns.
Emerson Network Power, a business of Emerson (NYSE:EMR), delivers software, hardware and services that maximize availability, capacity and efficiency for data centers, healthcare and industrial facilities. A trusted industry leader in smart infrastructure technologies, Emerson Network Power provides innovative data center infrastructure management solutions that bridge the gap between IT and facility management and deliver efficiency and uncompromised availability regardless of capacity demands. Our solutions are supported globally by local Emerson Network Power service technicians. Learn more about Emerson Network Power products and services at www.EmersonNetworkPower.com

While every precaution has been taken to ensure accuracy and completeness in this literature, Liebert Corporation assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions. © 2012 Liebert Corporation. All rights reserved throughout the world. Specifications subject to change without notice. All names referred to are trademarks or registered trademarks of their respective owners.

® Liebert is a registered trademark of the Liebert Corporation.