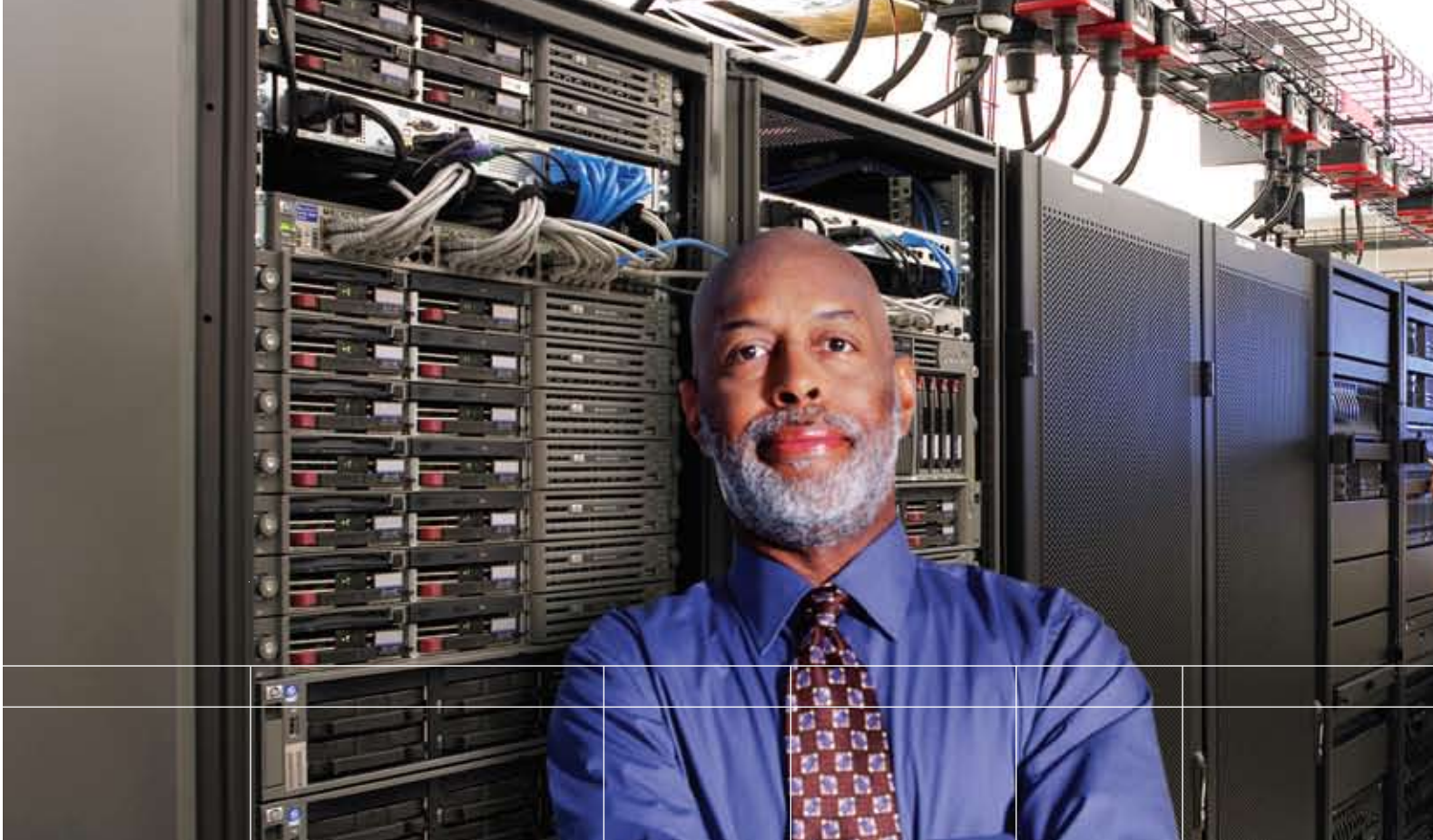
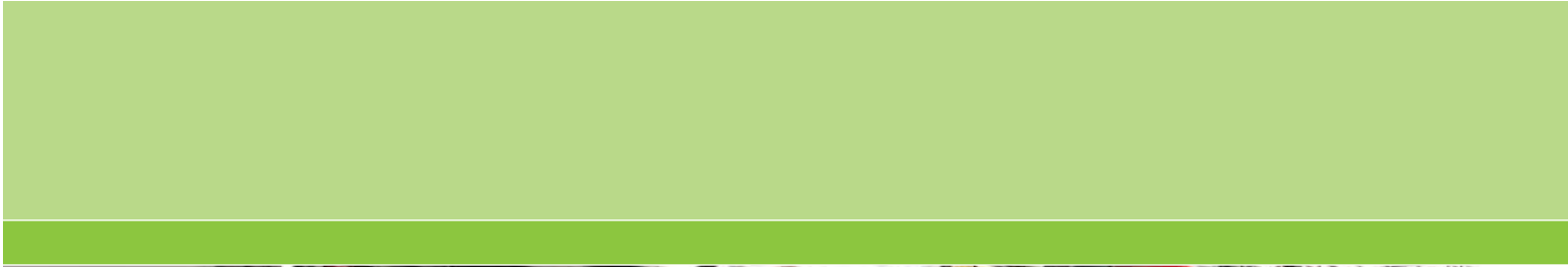


Get More From Your Data Center

Rely on Liebert for More Capacity, Utilization and Performance

GET MORE!™ CONSOLIDATION / VIRTUALIZATION APPLICATION GUIDE





The promise of virtualization

IT management is under enormous pressure to maintain or increase computing and data center performance while managing costs. Server consolidation and virtualization represent one of the most promising means for accomplishing that goal.



Warning signs that your infrastructure may not be ready for virtualization.

Is your data center infrastructure ready to meet the increased demands of consolidation and virtualization? Here are some warning signals that your infrastructure may not yet meet the increased power and cooling requirements for a planned consolidation / virtualization strategy.

- You cannot control access to your racks nor adequately control equipment adds and changes.
- You haven't calculated power and cooling demands for the consolidated environment.
- You are using line interactive UPSs and power has dropped when the UPS failed.
- Your critical power system consists of multiple small UPS units rather than a centralized UPS system.
- You have difficulty keeping temperatures in the room at below 78 degrees F before new equipment is installed.
- You have no way to target additional cooling to racks with densities above 5 kW.
- You have no way to monitor power and cooling system performance for trending and to be alerted to potential problems.
- You have not updated your service level agreements.

The Right Strategy

Server consolidation and virtualization create opportunities to reduce IT costs, enhance computing performance and improve data center space utilization. But they also introduce power and cooling challenges that, unless addressed, will limit your ability to realize the promises of these initiatives.

Liebert solutions from Emerson Network Power let you get more from your data center by:

- Removing power and heat density constraints to IT growth
- Putting more high performance servers in fewer racks
- Protecting server performance and availability
- Optimizing power and cooling costs
- Using less data center space

This guide is designed to help you get more from your virtualization initiative. With it you can:

- Identify gaps in your IT infrastructure that could limit the success of your consolidation project
- Learn how to apply new infrastructure technologies to increase the utilization, performance and reliability of your data center
- Accommodate future data center growth without disruptions

The Challenges

Consolidation and virtualization change the power and cooling profile of the data center. The benefits of consolidation and virtualization may not be realized if power and cooling strategies are not adjusted.

Physical Security

IT equipment is vulnerable to failures caused by unauthorized access and unauthorized adds and changes. Server consolidation concentrates applications on fewer servers, which then need to be protected by lockable enclosures and software giving you the ability to monitor and control access and equipment changes.

Power Management

Server consolidation will likely increase the power draw within the rack and may increase rack criticality. UPSs must be sized and configured to handle increased capacity, reliability and redundancy.

Heat

Denser, more powerful servers generate more heat than the systems they are replacing. Blade servers in particular concentrate heat within a small space. Building air conditioning is unlikely to be sufficient for cooling consolidated environments and precision cooling needs to be added. Hot spots that arise from higher density servers may need specialized high density cooling.

Visibility and Control

Enhanced monitoring is critical in a consolidated environment. Data centers need to be monitored for assured equipment utilization and adverse environmental conditions such as high temperature and humidity and water leaks.

Maintenance and Service

Lack of scheduled maintenance and service can cause unplanned downtime in the increasingly critical environment created by consolidation and virtualization. Extending the useful service life of the power and cooling equipment through proper maintenance, predictive monitoring, and keeping the systems current reduces the likelihood of downtime.

How to ensure your infrastructure is virtualization ready

Here are measures you can take to ensure your infrastructure is ready to adapt to the changes brought on by a virtualized environment.

1. Perform Power and Cooling Assessments

Your data center power and cooling profile will change with consolidation and virtualization. Determine power and cooling availability, capacity and redundancy for the consolidated data center to identify risks and vulnerabilities that could adversely affect the outcome of your project.

Calculate the power required by your data center and within each individual rack to ensure you have adequate UPS capacity. Look for potential points of failure, where the loss of one power component can threaten the larger system. Keeping power line drawings for the room up-to-date can allow you to identify where to employ redundancy.

For cooling analysis, a Computational Fluid Dynamics (CFD) assessment can show you exactly how airflow will occur in your consolidated environment and where hot spots and other cooling challenges will exist. Your room and rack power loads can help you determine levels of cooling capacity. Redundancy can be built into the cooling system to eliminate potential points of failure.

Your local Liebert Network Solutions Partner, working with a local Liebert Representative, can provide a data center assessment for power and cooling.

2. Provide physical security

In the more critical consolidated environment, equipment needs to be protected from unauthorized access — whether your data center is a single rack or multiple racks.

Utilize racks, such as Knurr racks and cabinets, which have key or card swipe locks so you can authorize access only by qualified individuals. Within your racks, utilize smart PDUs, such as the Liebert MP Advanced Power Strips, which let you monitor power at the receptacle level and enable receptacles to be activated or turned off. This will help you prevent unauthorized equipment adds and changes that can lead to circuit overloads, as well as simplifying in-rack power distribution and reducing cabling.

3. Ensure you have adequate UPS capacity

Industry analyst and author Barb Goldworm summed up the reality that should shape your critical power strategy: “With virtualization, since each server runs multiple virtual server workloads, the server becomes a single point of failure. This escalates the issue of availability for that physical server. If you put all your virtual eggs in one basket, then you need to take very good care of that basket.”

UPSs installed years ago may not have the capacity or reliability required for upgraded servers or blade servers common to consolidation / virtualization projects. Ensure that UPS sizing and backup are adequate for today’s needs and future growth.

Make sure you calculate your UPS size based on the full load of protected equipment — not “nominal loads,” which are estimates of average loads and could result in undersizing your UPS capacity.

Power protection, like computing, can benefit from consolidation of multiple smaller systems into fewer, more powerful systems. When total room load exceeds 15kW, consider replacing rack-based UPS systems with room level systems, such as the Liebert NX or the or Liebert NX with Softscale technology. The Liebert NX provides higher capacity, reliability and redundancy than rack systems. The Liebert NX with Softscale technology lets you increase capacity via a software key, without adding hardware.

4. Increase the reliability of your UPSs

You may desire to use the same line interactive UPSs you’ve always used for racks. However, the consolidated environment increases criticality, and may be better served by online UPSs with fault tolerant design. The online Liebert GXT rack UPS is twice as reliable as more commonly used line interactive UPS, as measured in MeanTime Between Failure (MTBF). That’s because it has an internal bypass that allows power to continue to protected equipment in the event of a UPS component failure. Room level UPSs, like the online Liebert NX, have even higher reliability due to their bypass technology and longer lasting batteries.

5. Plan for power redundancy

The critical environment of consolidation and virtualization will likely mean you want to add redundancy to your power system. The servers you use will likely be dual corded, which means they are designed for power redundancy. The highest level

of redundancy is providing separate UPS, PDU and circuit for each cord. Exactly how much power capacity and redundancy you need depends on your organization’s sensitivity to downtime and your budget.

6. Increase the criticality of your cooling systems

If the heat from a rack is not effectively removed, the performance, availability and lifespan of the equipment in the rack will be reduced significantly. As you adopt the latest server technologies in your data center, you may be exposed to higher failure rates, especially in the top third of the racks where heat builds up.

The right cooling systems can eliminate the constraints to server deployment caused by higher temperatures, allowing you to fully populate your racks.

If you are using building air conditioning for your IT spaces, consolidation will likely create a need for dedicated cooling and even high density cooling. Compared to comfort cooling, dedicated systems provide year round cooling, move more air than comfort systems, eliminate large swings in temperature and humidity and provide higher levels of air filtration. For spaces with single racks, the Liebert Foundation MCR (Mini-Computer Room) is an integrated cooling enclosure that can support power loads of up to 1.6kW and the Liebert XDF enclosure system can support high density power loads of up to 14.4kW per rack. In fact, the Liebert XDF can house the same computing capacity using the latest virtualized servers as a 2,000 square foot computer room with older generation servers.

How to ensure your infrastructure is virtualization ready (cont.)

For room level cooling, consider the ceiling mounted Liebert MiniMate2, floor mounted Liebert DS and Liebert Challenger 3000, or the wall mounted Liebert DataMate.

For high density situations where room level precision cooling is already in place, consider supplemental high density cooling provided by the Liebert XD family of products. These systems bring cooling closer to the rack and therefore provide an effective and efficient solution for high density issues.

Turn to your local Liebert Network Solutions Partner, who can work with the local Liebert Representative to evaluate your cooling needs and recommend just the right solutions.

7. Gain real time visibility and control

With server consolidation and virtualization, the need to know what is happening within equipment racks at any given time becomes vital.

Ensure Liebert UPS systems are network enabled, using technology such as the Liebert Intellislot Web Card. Software such as Liebert Nform will provide alerts for adverse system or environmental conditions, and allow you to conduct graceful shutdowns of IT equipment in the event of extended power outages.

The rack mount Liebert vEM-14 is available for monitoring of temperature, humidity, water leakage and contact closures.

Remote monitoring of power and cooling systems from Emerson Network Power is available if you do not have the internal personnel to do it.

8. Upgrade service and maintenance

The addition of higher criticality IT equipment is an ideal time to revisit your service and maintenance processes and contracts.

Extending the useful service life of the power and cooling equipment through proper maintenance, predictive monitoring, and keeping the equipment up-to-date increases equipment life spans and maximizes performance.

Service level agreements should be reviewed at this time and modified with higher criticality in mind.

After adding new power and cooling equipment, be sure to use factory certified service technicians for maintenance. Liebert service providers are factory certified and are part of a continuous training program. When disaster hits, Liebert service contracts guarantee a four hour response time.

For small UPS systems, the Liebert Power Assurance Package provides onsite service and battery replacement programs for the rack mount Liebert GXT. Larger systems come with installation and service contracts available.

Be prepared for virtualization.

Starting off on the right foot is the best way to make sure that your infrastructure is able to adapt to a virtualized environment. By making some up front calculations and following the right steps, your business will be ready for the change. Liebert has the expertise to guide you through the process and the products to make sure your data center continues operating at peak performance.

Liebert Checklist for Consolidation / Virtualization

Below is a checklist to help you evaluate your IT infrastructure for consolidation and virtualization. Be sure to work with your local Liebert Network Solutions Partner to review your needs and determine exact equipment requirements.

Availability Considerations	YES	NO
Have you calculated your cost of downtime for IT equipment to help determine your desired availability levels supported by your power and cooling infrastructure?		
Physical Security	YES	NO
Is your IT equipment secure from unauthorized access?		
Do you have monitoring in place so you can be alerted when cabinets are opened or equipment is added or changed?		
Power	YES	NO
Have you sized UPSs for a combination of actual power usage and planned expansion?		
Are you using full loads and not nominal loads to size UPSs?		
Are your line drawings up to date so you can identify single points of failure?		
For dual corded redundancy, is equipment connected to two PDUs, UPSs and circuits?		
Are you using online UPSs to provide the highest levels of reliability for your critical consolidated environment?		
If you are using a generator, are your UPSs compatible with generators?		
Cooling	YES	NO
Have you calculated the amount of time your IT equipment can operate without cooling in the event of an outage?		
Are you using dedicated or precision cooling for critical IT systems?		
Are your racks arranged in hot aisle / cold aisle configuration to facilitate heat removal?		
Do you have adequate cooling redundancy with loads distributed between multiple cooling systems?		
Are you adding high density servers that increase rack loads beyond 5kW, which then may require dedicated or supplemental high density cooling systems?		
Do you inspect your racks routinely for hot spots and document temperature measurements for trending?		

Liebert Checklist for Consolidation / Virtualization (cont.)

Monitoring & Management	YES	NO
Do you use network communications software?		
Do you want to monitor power and cooling equipment via your network?		
Do you want to be able to send alerts, initiate graceful shutdowns of equipment and control power usage within the rack?		
Do you monitor for heat, humidity, and water leakage in your IT spaces?		
Do you have UPS battery monitoring systems in place and a preventative maintenance program?		
Do you routinely review your monitoring logs or do you need a remote monitoring service to do this for you?		
Preventative Maintenance & Rapid Response Service	YES	NO
Have you evaluated your outside service level agreements in light of your consolidated environment?		
Are your service providers factory certified?		
Do you have immediate phone support for service – 7 x 24 x 365?		
Do you conduct UPS and battery checks or other types of UPS preventative maintenance?		
Do you know the MTBF and expected life span of your UPS and cooling equipment to ensure you have performed adequate preventative maintenance?		
Do you need a long term warranty and service package to provide preventative maintenance and repair?		

For assistance with power and cooling solutions, contact your local Liebert Network Solutions Partner.

Key Liebert Products For Consolidation / Virtualization

Product	Why It's Right for Server Consolidation
Racks & Cabinets	
Knurr Racks & Cabinets	<ul style="list-style-type: none"> – Locks and contact closures can be monitored remotely to protect against unauthorized access – 83% perforated doors facilitate airflow for improved removal of potentially harmful heat
Liebert MP Advanced Power Strips	<ul style="list-style-type: none"> – Protect against unauthorized equipment adds and changes – Allow remote control of power usage at the receptacle level to avoid circuit overloads
Monitoring	
Liebert Intellislot Web Card	<ul style="list-style-type: none"> – Provides network communications for Liebert equipment
Liebert Nform	<ul style="list-style-type: none"> – Alerts you to adverse equipment and environmental conditions before they create problems and provides for graceful shutdown if required – Dashboard view of infrastructure status
Liebert vEM-14	<ul style="list-style-type: none"> – Monitors temperature, humidity and water leakage and contact closures
Enterprise Remote Monitoring	<ul style="list-style-type: none"> – Monitors power and cooling systems and environmental conditions for customers that lack the time or personnel
Power Protection	
Liebert GXT Rack and Tower Mount UPS	<ul style="list-style-type: none"> – Provides twice the reliability as commonly used line interactive UPSs – Fully conditions all power irregularities that can affect IT equipment – Easily paralleled for redundancy and capacity
Liebert NX with Softscale Technology	<ul style="list-style-type: none"> – Room level protection to consolidate smaller UPSs and reduce potential points of failure – High reliability, faster response to power demand changes, longer product life and lower energy costs – Software scalable – Lets you purchase the capacity you need today and increase capacity later without adding hardware

Key Liebert Products For Consolidation / Virtualization (cont.)

Product	Why It's Right for Server Consolidation
Cooling Systems	
Liebert Foundation MCR (Mini-Computer Room)	<ul style="list-style-type: none"> - Integrated cooling cabinet - A secure enclosure with cooling for up to 1.6 kW of equipment - Optional power management and monitoring accessories
Liebert XDF	<ul style="list-style-type: none"> - High density cooling cabinet for up to 14.4 kW - Optional power management and monitoring accessories
Liebert MiniMate2 – Ceiling Mount	<ul style="list-style-type: none"> - Provides more effective cooling, humidity control and air filtration than comfort cooling systems - Takes up no floor space - Designed for small data centers without available floor space
Liebert DS – Floor Mount	<ul style="list-style-type: none"> - Provides more effective, precise, reliable control of room temperature, humidity and airflow than comfort cooling systems - High energy efficiency
Liebert Challenger 3000 – Floor Mount	<ul style="list-style-type: none"> - Provides more effective control of temperature, humidity and air filtration than comfort cooling systems - Small footprint for space constrained data centers
Liebert DataMate – Wall Mount	<ul style="list-style-type: none"> - The perfect solution for cramped quarters requiring more effective temperature and humidity control and airflow than comfort cooling systems
Liebert XD Supplemental Cooling	<ul style="list-style-type: none"> - High density cooling adds capacity where needed - Highly efficient because they put cooling in the rack row or close to the IT equipment - Multiple form factors to accommodate space requirements
Service & Maintenance	
Service & Maintenance	<ul style="list-style-type: none"> - Liebert service and maintenance contracts for larger power and cooling systems ensure systems are trouble free and up to date - Guaranteed 4-hour onsite response times, and often less in actual practice - Liebert 5-Year Power Assurance Package provides onsite service and battery replacement for the Liebert GXT

How to get started

Virtualization will add complexity to data center management, so it's critical that infrastructure issues be addressed simply and effectively. Look for solutions providers that have been trained in power and cooling issues and can offer a full range of solutions. Your local Liebert Network Solutions Partner, working with a Liebert Representative, can evaluate your IT environment and prescribe solutions that answer today's needs and accommodate tomorrow's growth.

And when you rely on Liebert's full range of solutions, you know that your system is backed by the most comprehensive service network in North America — bigger than the service networks of our three largest competitors combined.

To find a Liebert Network Solutions Partner near you, **call 1-800-844-8816.**

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