

12V DC Integrated Rack Solution from Vertiv™



Challenge

The Challenge

- The need for rapid, scalable, and resilient computing capacity to meet the exponential growth in data traffic is forcing data center operators to rethink their critical infrastructure architecture.
- Deploying rack-based solutions that streamline infrastructure footprint, increase energy efficiency, maintain high availability, and reduce costs is key to keeping pace with consumer demand for data.

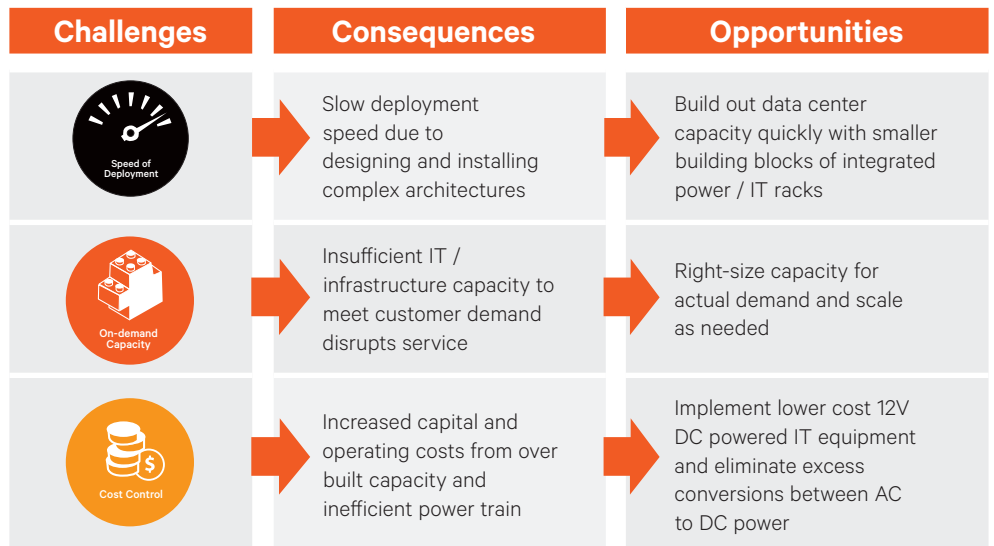
The Path to Optimized Rack Architecture

Data center designs continue to evolve and drive efficiency improvements at all levels in the data center. Open Compute Project (OCP)-inspired architectures, driven by Facebook and others, integrate the rack into the data center design in order to build one of the most efficient computing infrastructures from “grid to gates.” One element of this infrastructure is 12V DC power distribution within the rack for OCP-designed 12V DC servers and storage equipment.

12V DC distribution systems can be found today in several end-user applications. For services such as social media or web

search engines, where lower-tier availability is sufficient for the application, 12V DC distribution with in-rack battery backup is a very cost-effective alternative. Other applications, such as high performance computing, can be more efficiently powered with 12V DC distribution and still rely on traditional AC backup for higher-tier resiliency. Even financial sector enterprises are moving their basic IT applications onto the 12V DC architecture to save costs.

Let Vertiv's™ experts work with you to optimize your data center architecture with a 12V DC integrated rack today.



12V DC Integrated Rack Solution from Vertiv™

Traditional AC Power Distribution in a Data Center

Traditional data center power architectures typically utilize two AC transformation stages, redundant room-based AC UPSs with lead-acid VRLA batteries, in-rack AC power distribution units (PDUs), and redundant embedded power supply units (PSUs) that convert AC to 12V DC for consumption by the IT equipment (server, storage, and network devices).

This traditional design enables multiple tiers of power protection and availability for all end-user applications. However, AC voltage transformations, double conversion at the UPS, and redundant embedded power supplies for each IT device can lead to inefficiencies as well as

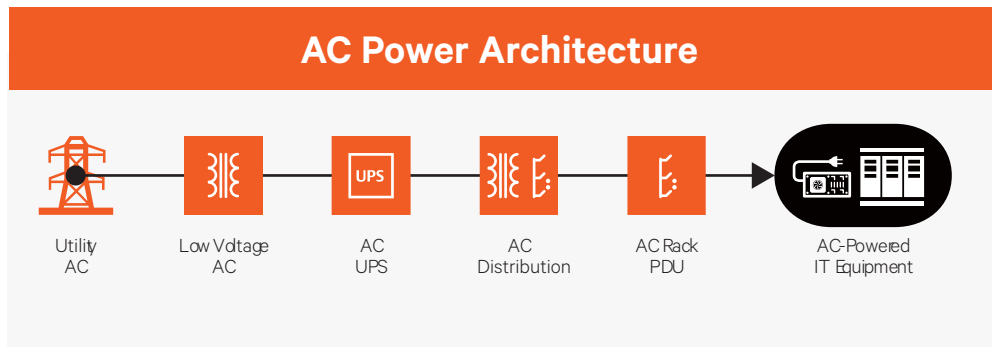
stranded power and phase balance challenges. Also, enabling capacity on demand can require higher capital expenditures due to the size of the building blocks. For example, UPS systems may need to be procured with capacity larger than the initial IT load.

For today's data center designers, speed of deployment has risen to the top of the list of design criteria. They need to bring on capacity quickly and incrementally without compromising capital efficiency. One way to do this is to drive power distribution/protection to the rack, making the rack an autonomous unit that can be brought on line without adding capacity to a centralized power protection system.

The simple approach to implement this scheme would be to place UPS systems in each rack. But rather than replacing a large centralized UPS system with hundreds of small UPS systems, data center designers have the opportunity to remove unnecessary components from the power chain.

Further, many applications such as e-mail, search engines, and social media hosting do not require the long holdup times built into higher-tier availability models. These applications need shorter holdup times to enable bridging to the generator, or virtualizing/moving the IT load and powering down the IT equipment.

Vertiv™ delivers critical power infrastructure at the rack level by utilizing a centralized 26.4 kW power system and in-rack DC bus distribution that provides 12V DC directly to the servers,” said Dan Dowling, Vice President of Engineering Services, Penguin Computing.



Centralized UPS and batteries needed to backup both IT and critical infrastructure

Power plants and batteries housed independently from IT equipment

For high availability, IT capacity must match the amount of centralized backup

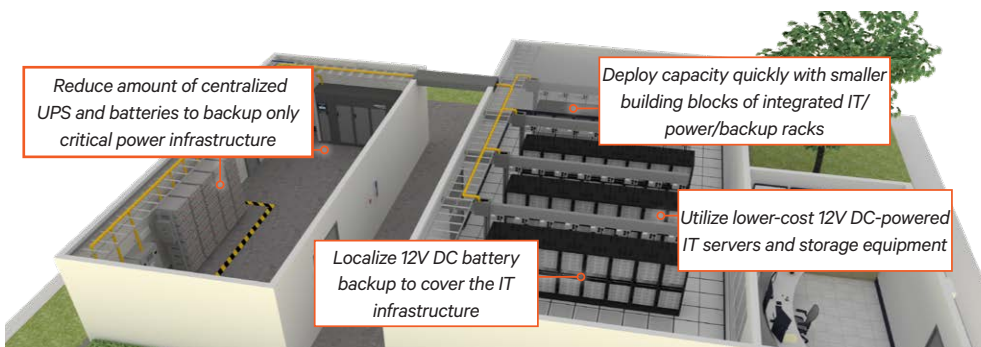
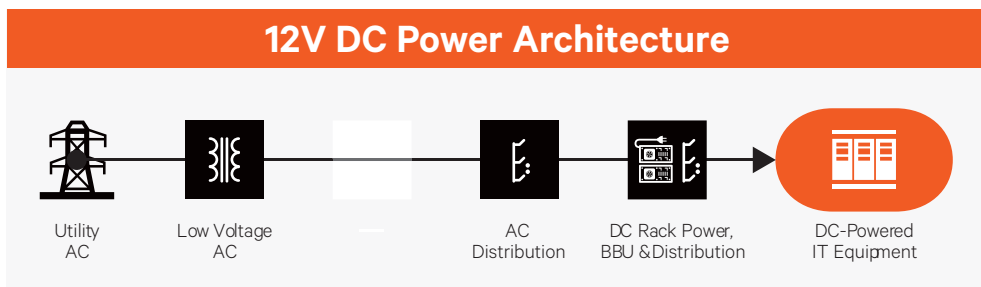
Traditional IT servers, storage and network devices

12V DC Power Distribution in a Data Center

Inspired by the Open Compute Project, higher efficiency data center power architectures focused on DC-powered IT equipment have been developed and shared across the industry. Two significant changes are the shifts away from redundant embedded PSUs and from large bulk UPS systems.

Data center designers can now utilize centralized rack-based power systems comprising rectifiers and lithium ion battery backup units (BBUs), which eliminate the embedded PSUs and UPS backup respectively. The rectifiers receive AC power and convert it to 12V DC power for use by the IT equipment. In the event of a power interruption, the BBUs provide short-term ride through of 12V DC power.

Centralizing power in the rack allows both main power and backup power to scale at the same rate as the IT load. With Vertiv™'s 12V DC integrated rack solution, IT loads and power are configured to minimize stranded capacity and to size hold up times according to the user's needs. The result is an efficient and economical power strategy that provides ultimate flexibility by enabling IT capacity to be added one rack at a time.



12V DC Integrated Rack Solution

Vertiv's solution integrates the rack, bus bar distribution, and an intelligent power system into an autonomous DC power infrastructure, ready for an end-user or IT integrator to rack-n-roll their OCP-compliant server, storage and network devices.

NetSure® 12V DC Power System

Our NetSure power system integrates 3 kW rectifiers, 3 kW BBUs and a smart controller in a compact 3U shelf that provides up to 24 kW DC power. Hot-swappable rectifiers and BBUs can be mixed-and-matched, and the shelf can accommodate up to three power feeds with multiple redundancy schemes and various holdup times. Learn more about the power system at: Vertiv.com/12VDC.

At the rack level, the NetSure system provides advanced energy management features that reduce energy consumption during low IT load conditions and supplement power capacity during short-term periods of high IT load conditions or AC utility limitations.

Racks & Distribution

Our rack is available in 42 OU and 48 OU heights, as an open four-post frame or enclosed with doors and sides. The rack's 600 mm width allows easy replacement of traditional EIA racks during IT refresh cycles.

Bus bar distribution can be configured to accommodate multiple power arrangements and is designed to support single, dual or triple independent power zones that can each house a power system (single zone with one power system shown here). Alternately, a single power zone can provide up to 72 kW of power by paralleling three NetSure systems together – delivering the highest density 12V DC power rack in the industry.

Economical, Scalable, and Flexible Critical Power Architecture

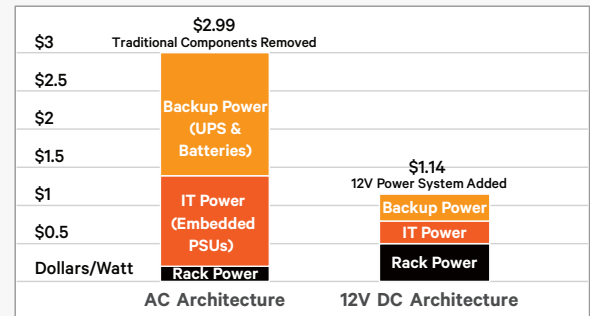
In the 1.5MW power train example shown above, capex savings of \$1.85 per watt are achieved by deploying 12V DC integrated racks instead of traditional AC power architectures. On the left, AC UPSs and AC rack PDUs provide the power protection and power distribution respectively for conventional IT loads. On the right, for IT applications with less stringent performance requirements, 12V DC power distribution and power protection in the rack can be deployed more cost-effectively. Significant savings are realized by removing the embedded PSUs from the IT equipment.

average IT load, peak load, AC input limitations, rack density, and backup requirements. This approach enables IT

equipment to be integrated, factory -tested, racked and rolled directly into the data center.

Recognize a total savings of \$1.85* per watt when leveraging a 12V DC power architecture instead of the traditional AC power set up.

*Calculations based on 1.5 MW Power Train / 1.2 MW IT Load.



Further, rack-based power distribution and protection provide a more scalable solution. When more IT capacity is needed in the data center, 12V DC racks can be installed instead of adding capacity to a centralized AC power architecture. When more IT capacity is required within the rack, more rectifiers and BBUs can be added to the shelf. When an IT refresh cycle is needed, 12V DC IT equipment can be replaced without touching the power infrastructure, saving even more capex. This integrated rack solution enables additional capacity to be rapidly deployed to meet growing IT demand.

Work with Vertiv™ solution architects to take advantage of the flexibility that 12V DC power offers. We assess site infrastructure to determine exactly how the racks should be configured – including distribution options, power density and battery capacity. We right-size the solution based on several factors such as the underlying IT applications,

Global Resources with Local Knowledge

Vertiv's service expertise and project management capabilities make data center planning and deployment easy. We have the resources to service your facility anywhere, anytime. We are available 24/7/365 to support your site needs.

Project Services

Simplifying Installation

Vertiv's Services team takes a holistic approach to your network to make sure that every facet of your infrastructure is rapidly deployed and operating at maximum efficiency from day one. We offer a full portfolio of essential services, from site survey to hand over of the site, all managed through a single interface thanks to regional project management teams.

Performance Services

Improving Availability, OpEx and CapEx

By leveraging our in-house knowledge of DC power, inverters, batteries, generators, thermal management, UPS, alternative and other energy sources, we pay attention to the entire infrastructure and help keep your network reliable in even the most challenging environments.

Maintenance Services

Preventive Maintenance

Keeping your equipment at best possible status requires regular maintenance. Vertiv can serve as the single point of contact for all your maintenance needs. We understand your unique challenges and will tailor a service agreement that meets or exceeds your requirements. Complete documentation is provided along with recommendations of corrective steps to prevent future problems.

To access the product warranty process, optimize your after-sales experience, and obtain more information, please register your Vertiv products at [Vertiv.com/ProductRegistrationLATAM](https://www.vertiv.com/ProductRegistrationLATAM)