

# Uninterruptible Power Supply (UPS) Systems for the Network Edge

Powering edge growth with uninterruptible power supply (UPS) systems

Types of UPS system configurations

Online double conversion

Line-interactive

Standby

Lithium-ion batteries for network edge UPS

Conclusion and resources



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## UPS for the Edge Data Center

To support the vast universe of applications requiring computing, data centers are becoming more and more complex. At the same time, more of this computing is happening at the edge of the network, absent on-site IT support.

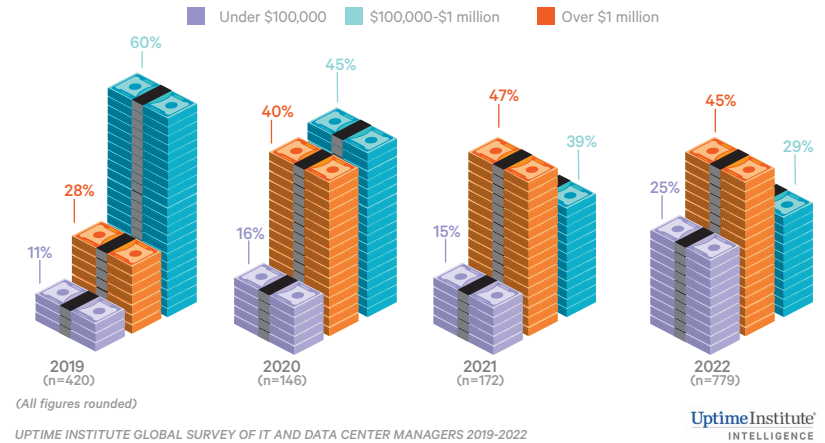
As your business looks to support new edge applications and migrate computing and storage closer to customers, associates, and devices, your network backup power becomes more important than ever. Outages can be costly and damaging — not just while the power is out, but also when recovering from one. The critical systems that sustain your business operations can't go down.

### Challenges at the Edge

- Limited budget
- Lack of skilled IT resources onsite
- Little to no cooling
- Space-constrained environments
- Demand for high availability
- Need for remote management

### Outages costing over \$1 million are increasing

Please estimate the total cost of your most recent downtime incident (from outage to full recovery) for your organization, including direct, opportunity and reputation costs, using the following options.



Commonly known as a battery backup, an uninterruptible power supply (UPS) is a rechargeable battery used to backup main power feeds and provide seamless power when there is a main line utility outage. UPS Systems provide adequate power during short-term interruptions, surges, and blackouts to safeguard your data, software, and hardware, while maintaining business continuity. The right UPS solution can provide you with:

- Protection of your valuable business assets and data when power is disrupted
- Peace of mind regarding power management in remote locations
- Improvement to business efficiency when costly downtime is eliminated

**It's time to find the right UPS for your edge.**

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## Types of UPS System Configurations

The three major types of UPS system configurations are defined by how power moves through the unit. All three basic UPS technologies have their place in protecting today's distributed IT infrastructure, especially at the network edge. Each technology has its advantages, and each may be necessary for configuring cost effective power protection, especially in complex systems.

Selecting a UPS for your edge requires an examination of several factors:

1. Determine the size of the load that needs UPS protection, and hence, the capacity of the UPS
2. Pure versus simulated sinewaves
3. Runtime as it relates to UPS capacity versus load
4. Installation requirements and environmental challenges
5. Battery chemistry or lithium-ion versus lead-acid batteries

Click configurations below to learn more about each type.





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## Online Double Conversion UPS

AC power is stable and clean upon generation, but during transmission and distribution, it is subject to voltage sags, spikes, and complete failure that may interrupt computer operations, cause data loss, and damage equipment. When it comes to safeguarding critical IT loads, only online double conversion technology protects fully against all these power problems, providing the highest levels of security for networks.

An online UPS system is usually called double conversion as well because incoming power is converted to direct current (DC) and then converted back to alternating current (AC). This AC-DC/DC-AC design ensures an increased degree of isolation of the load from the irregularities on the main supply.

The online UPS takes the incoming AC power supply and converts it to DC using a rectifier to feed the battery and the connected load via the inverter, so that no power transfer switches are necessary. If the main AC input fails, the rectifier drops out of the circuit and the batteries keep the power flowing to the device connected to the UPS. When AC input power is restored, the rectifier resumes carrying most of the load and begins charging the batteries.

Because power runs through an online UPS continually, output is a perfect sine wave. This type of UPS protects the critical load from virtually all power disturbances, including subtle harmonics and waveform distortion.

### Online Double Conversion



Vertiv™ Liebert® GXT5 UPS





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This means the quality of power from an online UPS is significantly better than that of other technologies. Offline and line-interactive technologies reduce the impact of spikes, surges, and sags by either clipping the peaks and valleys, boosting power, or switching to battery backup. Within the normal track of an electrical sine wave, however, most power fluctuations are left alone. Online UPS systems regenerate the sine wave, not just conditioning of the raw utility supply.



### Why It's Right for the Edge

**Online double conversion provides the highest level of power conditioning and protection for critical business IT systems such as network edge equipment and business servers.**

- Continuous, high-quality AC power to equipment with no break when transferring to battery
- Equipment protection from virtually all power disturbances due to blackouts, brownouts, sags, surges, or noise interference
- 100% power conditioning
- Zero transfer time to battery and no change in output voltage

[See Vertiv™ Online Double Conversion UPS Solutions Now.](#)

Best used by:



Banking and Financial Institutions



Hospitals



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## Line-Interactive UPS

Line-interactive UPS systems provide both power conditioning and battery backup. This technology is particularly effective in areas where outages are rare, but power fluctuations are common. Line-interactive UPS systems support a wide range of input voltage fluctuations before switching to battery backup.

Beyond battery backup, line-interactive UPS units provide far better control over power fluctuations than offline systems. The critical advantage of a line-interactive UPS is the voltage boost circuitry and the range of input voltage that the UPS accepts. The wider the range, the more total protection you will have.

Line-interactive UPS technology provides power conditioning with a 4-6 millisecond break in power when transferring to battery backup and protects against the most common power problems experienced in a network. In this configuration, the UPS also monitors the voltage level and balances under- and over-voltages. This technology provides a good choice between reasonable protection and moderate operating costs.

With a line-interactive UPS, the inverter becomes part of the output and is always on. The inverter can operate in reverse to charge the battery while AC input is normal, and switch to battery power when input fails, which

### Line-Interactive



Liebert® PSI5 UPS Li-ion



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provides filtering and voltage regulation. Line-interactive UPS systems rely on the battery to condition power, so this type tends to drain its battery more frequently than online UPS systems that condition power through the double-conversion process.

When AC input power fails, the unit's transfer switch opens and the power flows from the battery to the UPS output. With the inverter always on and connected to the output, line-interactive UPS systems provide additional filtering and yield reduced switching transients when compared to a standby UPS. Line-interactive UPS systems are typically used in rackmount applications below 5000 volt-amperes (VA).



**Why It's Right for the Edge**

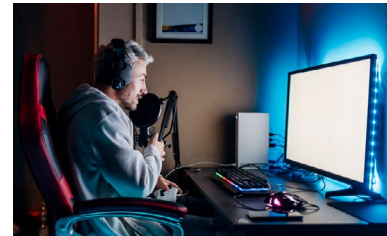
- Provides both power conditioning and battery backup
- Better control over power fluctuations than offline systems
- Good choice between reasonable protection and moderate operating costs
- Typically used in rackmount applications below 5000 VA

[See Vertiv™ Line-Interactive UPS Solutions Now.](#)

Best used for:



Retail



Gaming



Education



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## Standby

Offline UPS, also called standby UPS or battery backup, is a cost-effective choice. Better offline UPS systems switch to battery fast enough to prevent power anomalies and ensure continuity during short outages. An offline UPS protects against most spikes but doesn't maintain perfect power during minor sags and surges.

The key to offline UPS quality is the range of power the unit will except before switching to battery backup. The wider the range, the less drain on the battery and the more backup time available when the power shuts off. The more times the UPS switches to battery backup, the shorter the battery life.

Offline UPS technology will protect against most power spikes by clamping down on excess voltage and help ensure continuity during more than 90% of all outages. An offline UPS system passes utility AC power straight through the unit and past a transfer switch to the output point where the protected load is connected.

## Standby



Vertiv™ Liebert® PSA5 UPS





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When an input power failure happens, the built-in battery and the inverter, which converts the battery's DC power to AC, are activated and connected to the output by the transfer switch. There is generally about a 6-8 millisecond break in power when transferring to battery backup.

This technology is best suited for devices under 1500 VA such as small offices, personal home computers, and other less critical applications. An offline UPS is a good option for those requiring lower power capacity and cost. Offline UPS technology provides power backup protection for desktop equipment, gaming consoles, workstations, wireless networks, and other electronics. During a power outage, it provides enough runtime to save work in progress and complete an orderly shutdown of equipment. In addition to power backup, most offline UPS systems offer basic surge protection as well.



### Why It's Right for the Edge

- Protects from most power spikes by clamping down on excess voltage
- Helps ensure continuity during more than 90% of all outages
- Built-in battery and an inverter that converts the battery's DC power to AC
- Good option for those requiring lower power capacity and cost

[See Vertiv™ Standby Solutions Now.](#)

Best used for:



Small Office



Gaming



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## Lithium-Ion Batteries for Network Edge UPS

No longer just for consumer devices, lithium-ion batteries are now being adopted for use with UPS applications as a means of ensuring uptime for mission-critical infrastructure in data centers. Lithium-ion UPS battery backup systems are designed to provide twice the life expectancy of traditional valve-regulated lead-acid (VRLA) batteries. Through fewer battery replacements, ability to withstand higher temperatures, and quick recharge cycles, these systems are ideal for protecting your critical infrastructure in edge or distributed IT environments.

### Lithium-Ion Battery Backup UPS Advantages



#### Lower Total Cost of Ownership (TCO)

Taking into consideration the initial investment of a VRLA system in addition to the battery replacements and services that aren't needed with lithium-ion UPS, you are able to reduce the total cost of ownership of your UPS system by 50%.



#### Longer Life and Runtime

The life expectancy of a lithium-ion UPS is 8-10 years, which is 4x longer than comparable VRLA systems. When the lithium-ion battery needs a recharge, it can be complete in less than four hours.



#### Heat Resiliency

In instances where your racks are exposed to higher temperatures, such as manufacturing floors, lithium-ion batteries are a great option. These UPS systems can withstand higher temperatures without degradation as compared to systems with VRLA batteries.



#### Efficiency

For a much better performance, lithium-ion batteries are 40% to 60% lighter than VRLA counterparts. On top of being lighter, they are 40% smaller too. This makes lithium-ion painless to install, easier to maintain, and significantly more flexible. Also, while typical lead-acid batteries take 12 hours to charge to 90% full runtime capacity, lithium-ion only requires 2 to 4 hours.

[Learn more advantages in this white paper](#)



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Gain peace of mind with protection of your valuable business assets in your edge locations. The right UPS solution ensures your data, software, and hardware are protected during power surges and outages. Each type of UPS has its advantages for power protection. Please visit our [online UPS selector](#) or contact us for assistance finding the right one for you.

### Additional Resources

[UPS Selection Tool](#)

[Why Online UPS May Be the Solution for Your Power Backup Needs](#)

[How to Select a UPS for Power Backup](#)

### See How Vertiv Customers Are Using UPS Solutions

[State Government Agency Protects Smart School Operation With Line-Interactive UPS Solution](#)

[Top 20 Critical Access Hospital Deploys Vertiv™ Liebert® GXT UPS Units to Put an End to Unplanned System Outages](#)





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