UPS

- **What is a UPS?**
  UPS stands for uninterruptible power supply. A UPS is a back-up power system used to prevent power loss or damage to a computer or other critical piece of electrical equipment.

- **Why do I need a UPS?**
  There are many answers to that question.

  A good UPS system can help prevent down time, by providing clean power to critical systems when there is a power anomaly.

  A UPS can also protect equipment and help it last longer by acting as a power conditioner, filtering out surges, sages, spikes and outages.

  A UPS increases the productivity of computer users by keeping their computers functioning more reliably and preventing work loss.

  A Liebert UPS can provide back up power in a remote or powerless situation with the dark start capability, utilizing the batteries as a power source.

- **What kind of UPS do I need?**
  The type of UPS needed depends on how critical the system is which needs protection. There are three main types of UPS: off-line or standby, line interactive, and on-line (double conversion).

  1. An off-line or standby UPS is used as an alternative source of power when there has been a sudden loss of utility power. An off-line UPS generally provides a few minutes of back-up power to ride through the outage or in the event of an extended outage, allow a gradual shutdown of the connected equipment. An off-line UPS has few power-conditioning features, and will rely on battery power whenever utility power is unacceptable for the critical load. An off-line UPS is best for desktop computers, point-of-sale terminals or other applications that need some power protection but are not mission critical. An off-line UPS uses a voltage-sensing switch to activate the DC rectifier and draw power from the batteries when incoming power is not ideal. A standby UPS does little or no power conditioning and primarily acts as a switch to draw power from the batteries. Some surge in output voltage occurs when it switches from utility power to battery power. An off-line UPS has no user replaceable batteries and lasts 3 years, on average.

  2. A line-interactive UPS is useful for large desktop systems or a set of rack-mounted computers with up to 2200VA of power. While similar in functional layout to the off-line UPS, line-interactive technology also includes a buck and boost capability. This feature compensates for power surges and sags of +/- 25% of the normal incoming voltage without using batteries to regulate the voltage. A greatly reduced battery duty cycle means that the batteries in the UPS will last longer than in the off-line style and that the connected equipment has a greater degree of protection because the back-up power will be more reliable. A line-interactive UPS has about 5 minutes of back-up time when fully loaded, which is enough to ride out 90% of power anomalies and for extended outages, can shut down connected equipment gradually to prevent equipment damage. A line interactive UPS

uses a voltage sensing switch to draw power from the batteries when incoming power is outside of the buck and boost input voltage range. A minimal power loss and a surge in the outgoing power occurs at the time of transfer to the batteries. The PowerSure Interactive series of line-interactive UPS have user replaceable batteries and last 3 years, on average.

3. An on-line UPS is the third and best type of UPS. True on-line UPS systems are only those that employ double conversion topology. On-line delta conversion or ferroressonant systems are not on-line UPS systems. Those types of UPS are line-interactive. Liebert on-line UPS systems range from 700 VA to 1,100 KVA in size. An on-line UPS is designed for use with mission critical systems that cannot go down without causing significant work and or financial loss. The typical applications for an on-line UPS are manufacturing equipment, telecommunications systems, Internet service providers, financial networks, data centers and other critical networks or systems. An on-line UPS is constantly active, hence the name. On-line UPS systems convert all incoming power to DC, allows that DC power to pass across the battery circuit, called the DC bus, and then converts the power back into AC power and out to the protected equipment. The critical load is electrically isolated from utility power and receives continued highly regulated power. There is no output power disturbance or gap when there is a power loss or anomaly in the incoming power since the batteries are always connected to the DC bus from which the inverter draws its current. An on-line UPS can also accept as low as 50% of the normal incoming voltage without drawing power from the batteries. This allows the battery systems to have a longer run time and require less maintenance. In single phase UPS, on-line UPS batteries are all hot swappable and will last five years, on average.

- **What is a VA?**
  VA is a unit of measurement for power, similar to a watt or horsepower. VA stands for volt-amps. VA is used to signify the total power requirements of a piece of equipment. However, it is generally preferred to use Watts to measure power, since VA can be relative to the type of equipment and Watts is not. VA is the apparent power that is being used, whereas Watts is the actual power being used. Without getting too complicated, the difference between Watts and VA is the power factor. VA = Volts * Amps, Watts = Volts * Amps * Power Factor.

- **What is Power Factor?**
  Power factor is a measurement of how the incoming power is being used by a piece of equipment. Most computer equipment has a power factor of 0.7. This basically means that the equipment is using 70% of the incoming VA. For example, a computer designed to use 100 VA at a 0.7 PF is using 70 Watts. Liebert UPS systems are designed to output power with a 0.7 power factor so that the connected equipment does not waste power by not using it. Some equipment is power factor corrected, meaning its power factor is very close to 1.0. This type of equipment is more efficient because it is utilizing more of the incoming power and for all practical purposes the VA rating is the same as the Watts. All of Liebert's on-line UPS systems are power factor corrected to work with any type of equipment and to be as efficient as possible.

- **What is the difference between a surge suppressor and a UPS?**
  The biggest difference is that a UPS has battery backup power, and a surge suppressor or TVSS device does not. However a UPS is much more than a surge protector with batteries. A surge protector is designed to protect a sensitive electrical appliance from being destroyed by power surges and spikes. A UPS has this capability, but also conditions power so that the connected equipment always receives an acceptable voltage. A surge protector only protects the equipment from extreme voltage spikes and surges. A UPS can also protect equipment from brown outs, frequency variation, waveform distortion, outages, as well as voltage spikes and surges, and can shut down a computer safely in an extended blackout.

- **What size of UPS do I need?**
  The best way to determine what size of UPS is needed is to measure the amount of amps that are being used by the equipment to be protected. Look on the back of the equipment near the input power cord for a power rating plate. On this plate or label will typically be a maximum amp draw for one or more voltages. For example: a computer may be rated at 8/4 Amps and 110/220 Volts. This computer uses either 4 amps at 220 volts or 8 amps at 110 volts. 4 * 220 = 880 VA, and 8 * 110 = 880 VA, so this computer uses a maximum of 880 VA.

  Another consideration is the potential for future expansion.

- **How much back-up time do I need?**
  Back-up time is entirely dependant upon the application. If there is an alternative power source, such as a generator, to supply back-up power, a few minutes is probably fine, since a well maintained generator will come on in 30 seconds or less. More critical systems may need protection, to protect against the possibility that the alternative power source fails or isn't immediately available. If no alternative power source is available, back up times can be extended with additional batteries. However, batteries are expensive, heavy, and large, so be reasonable with expectations, and know that most power anomalies are over in five minutes are less.

- **What is the difference between three phase and single phase power?**
  Single-phase power is what most computers and telecommunication systems run on, as well as most things in your home or office. Single phase refers to the fact that one sine wave of voltage and current is being supplied and used. Three-phase power is used when large amounts of power are required for industrial systems, large electric motors and industrial equipment or a facility wide UPS. Three-phase refers to the fact that three offset synchronous sine waves of current and voltage are being used to obtain approximately 1.7 times as much power each of the individual phases.

- **What is better, a centralize UPS or multiple rack mount UPS's?**

  As a network administrator, do you need individual printers for each workstation on the network? Of course not. But this is exactly what some network administrators do when they configure power protection. They buy one UPS for each piece of equipment to be protected.

In many applications, particularly in medium to large sized networks, “clustering” critical network equipment offers your client numerous advantages in terms of greater security, lower costs, and increased performance and quality. This equipment or network cluster should be protected by a single UPS (not multiple), in order to achieve greater security, reduced costs, increased network performance, and increased network service quality.

The Success of Solution Sales

A leading UPS manufacturer, Liebert Corp., has found that unit sales of 3.5kVA - 18kVA on-line UPS’s are growing as an increased number of end-users adopt a clustered network strategy. “Server farms,” network rooms, equipment closets, and multiple racks are all possible applications for the astute network administrators who wants to differentiate his/her organization from the rest, to implement a clustered UPS approach.

The trend is for IS and LAN administrators to take increased control of (and responsibility for) distributed computing resources. IS/LAN administrators are increasingly becoming the decision maker about purchases. They are most likely to be responsible for the performance and financial parameters. They’re looking for uptime, service, reliability and return on investment. They’re also thinking about future expansion, and that’s much easier to accommodate with a single UPS.

When to Cluster

The opportunity for clustered protection is defined by the geography of the site. Network administrators should target their server farms, network rooms, equipment closets and multiple racks as well as on-site wiring to distribute conditioned power or for plans to install power distribution systems.

Why does it make sense to support these clustered loads with one UPS? Consider the following reasons:

· Higher reliability (on-line technology, fewer components, inclusion of internal and external bypass, power module control).

· Higher performing UPS’s (on-line units with voltage and frequency regulation).

· Easier to manage on the network.

· Lower cost - Fewer SNMP cards required (supports multiple operating systems).

· Lower future cost to maintain and support (one UPS, not multiple)

· Increased space utilization.

· Orderly shutdown/monitoring of multiple operating systems.

· Easier and cleaner to install and move.

· Single battery issue, not multiple.

· Easier to maintain (fewer units and batteries to test).

· UPS can be sized for future growth (i.e. Internet/telephony applications).

What to Look For

In general, in order to minimize risk for what is arguably a full featured device, an on-line UPS with voltage and frequency regulation, is in order.

On-line technology draws power from an AC utility source and conditions it before sending it to the sensitive piece of electronic equipment. This conditioning assures that no matter what power surges, sags or brownouts occur on the AC line, the power delivered to the sensitive device is pure and stable. At the same time the UPS continually recharges the battery, so if power is interrupted, backup is immediately available. An inverter in the UPS converts the DC from the battery to the AC needed by the electronic system.

The following are points to consider regarding UPS devices when buying a cluster-system:

· A power management function which affords the user complete

Control of connected equipment, allowing for orderly shutdown or orderly start-up of network equipment. Connected loads can be switched on and off according to a user programmable schedule.

· Upgradeability - the kVA rating of the UPS can be increased on-site,

ensuring that the equipment will not outgrow the UPS. A 3.5 - 18kVA size range allows the load to grow into the size of the UPS.

· Quality - end-users want continued up-time and do not want to worry

That the system will fail. The UPS should be reliable, and since there is no switching involved with on-line technology, switch over time is not an issue.

· Capacity - Many networks change dramatically over a single year.

Figure power protection requirements as far into the future as possible, and by identifying how power use can be clustered onto larger, more full-featured UPS's, you may be able to reduce your total cost per VA, and at the same time reduce the need for expensive reconfigurations in the future.

· A combination of clustered UPS's and SNMP communications allows

Network administrators to assign priorities to protection, with a server or communications hub receiving the highest priority.

The Large Scale Advantage

Large scale networks under a single roof require power systems designed expressly for mission-critical applications. This is because a large network can create its own power problems, including:

Harmonics that damage data and equipment

Power sources that switch on and off continually, creating constantly shifting, unbalanced, non-linear loads

An accumulation of hundreds of lower power factor computers and peripherals that waste energy and money

Power sags as equipment overloads available power sources

These examples don't even consider the problems that can be experienced with utility power.

The advantages of clustering begin with cost savings. Fewer SNMP cards to support multiple operating systems. Less maintenance and support for a single UPS/battery as opposed to multiple boxes and multiple batteries. Uptime and reliability are increased due to fewer components, a maintenance bypass, the performance of a true on-line UPS, and the advantages of voltage and frequency regulation.

There are numerous administrative advantages with a single UPS, as well. Installation and future moves will be easier and cleaner. Space utilization is better. A single UPS will be easier to manage over the network, and there's an opportunity to use power load modules to preserve battery time and make shutdown more efficient.

Why is this? Consider the following:

· End users want increased uptime, services and reliability.

· IS/LAN administrators are increasingly more financially responsible for decentralized computing resources.

· Budget constraints are driving more return-on-investment out of computing resources.

· Support costs and support issues are becoming increasingly important and a greater cost of doing business.

These reasons lead to a "clustering" of various network equipment which is being consolidated, located or re-located at one location. Many organizations are seeing a scattering of network equipment from sporadic growth or high growth in computing services.

Consider the following situation: Imagine a server farm in a room that was referred to as a computer room in the "old days." This room has 50 servers running three different operating systems. Is it a better solution to apply 50 UPS's of different vintage to each server, or one UPS large enough to support the entire load? Consider battery failure; will all the batteries fail at the same time, or is it better to have one system that is factory maintained and has 24 hour emergency service available?

From a battery standpoint alone, it is much better to have a single set of UPS batteries to test and eventually replace rather than multiple sets. It is also easier to manage fewer UPS's from a remote or central location. Consider the cost of one SNMP interface versus 50 SNMP interfaces.

A single UPS providing power to multiple loads also provides a much higher degree of reliability than multiple UPS's to multiple loads. Mathematically, a single point of failure is much more reliable than multiple points of failure.

Other reasons it makes sense to support clustered loads with one UPS:

· Lower initial cost of equipment/installation

· Lower future cost for maintenance/battery replacement

· One battery to maintain

· Internal bypass

· External bypass

· Upgradeability

· True on-line system providing voltage and frequency regulation

· Generator compatible

· Unattended shutdown of multiple servers and operating systems

Network administrators who have experience with the one-on-one approach have expressed a need for a better way to protect critical equipment, one that provides superior control, enhanced reliability, and cleaner installations.

When dealing with applications that require UPS's, it is more likely that an educated customer will justify a higher performance, on-line UPS for all of the above reasons rather than settle for the limitations inherent in a one-on-one approach.