



B2C Technology Story

Web Summary:

The Power Continuum

by Leon A. Enriquez

Reading Time:
8 minutes

Reader Benefit:

- ◆ Understanding why power supply protection is now a vital issue in mission-critical scenarios;
- ◆ Insights about how UPS systems work?;
- ◆ Types of UPS systems available and some selection criteria.

In the information age, the need for dependable, reliable and uninterrupted power supply will continue to increase exponentially with new users and applications. With highly sensitive electronic equipment, a proactive contingency plan – one that addresses failures and corruption of data and services – that deals with possible system failures due to poor or corrupted power must be implemented.

The prolonged experience of power loss is obviously unacceptable as most businesses cannot afford such a disruption – especially to their business-critical computing systems. The reality of living in these times – of rapid technological innovations and advances – is that the power supply to run the electric-powered machines can't keep up with the demand. Often, electricity generation, transmission and distribution have not evolved at the same pace as computer and communications equipment.



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The reality of living in these times – of rapid technological innovation and advances – is that the power supply to run the electric-powered machines can't keep up with the demand in many locations around the world. Often, electricity generation, transmission and distribution have not evolved at the same pace as computer and communications equipment.

What's a Power Event?

Consider the incidences of power outages such as sags, surges, noise, spikes, or blackouts. What really happens to our connected devices when they experience such a power anomaly?

For instance, a lightning strike is a good example. Yet, it is just one of many power problems that can strike your equipment.

Imagine lightning has just struck a nearby transformer. If the surge was powerful enough, it travelled instantaneously through wiring – AC, network, serial, phone lines and more – with the electrical equivalent force of a tidal wave.

For a PC user, the surge could have travelled into your computer via the AC outlet or phone lines. And the first casualty is usually your modem or motherboard, rapidly followed by your CPU chip, etc. And then, your vital data or valuable information is lost.



With the lightning incidence, the utility source responds to over-voltages by disconnecting the power grid. This creates brownouts and blackouts. Thus, if the voltage drops low enough, or blackouts, hard disks in your computing machinery may crash – destroying the data stored on the disks.

In all cases, work-in-progress stored in the cache is instantly lost. In a worse case scenario, password protection on the hard drives may be jumbled, or the file allocation tables may be upset, rendering the hard disks useless.

Costs of Downtime

In the information age, data is often your most valuable asset. This is simply because information is the lifeblood of businesses across the globe – whether in the form of financial transactions, or online purchases, or customer demographics, or correspondence, or spreadsheets, or the various business applications.

Compounding the need for continuous uptime availability, the Internet has mandated that availability equals viability. If a company does not have reliable solutions for the continuing operation of their computing infrastructure, they lose money both in terms of lost transactions as well as lost opportunities.

Consider the grim realities. If a company's Web server goes down due to blackout, customers may click over to a competitor's site. Or if mission-critical computers involved in the manufacturing process are damaged by a surge, the inventory levels fall behind resulting in missed schedules. Or if electronic noise penetrates sensitive testing and measurement machinery, delays become inevitable. The impact is usually a financial loss.

The UPS Solution

Electronic and PC equipment require a high quality of uninterrupted power supply. Yet, all electrical distribution systems are subject to interference. The voltage supplied by electrical power providers is intended to supply a stable 230 volts. However, no electrical installation is free of burnouts, interference and variations in voltage.

For example, various phenomena can cause excess voltages (above 260 volts) or voltage drops (below 180 volts). These surges and sags in voltage can jeopardise the optimal operations of sensitive computer systems.



Stable Uninterruptible Power supplies (or SUPs) – also known as inverters or UPS – are an ideal way of providing vital protection for the operation of your computer installations.

An uninterruptible power supply (UPS) is a device that allows your computer to keep running for at least a short time when the primary power source is lost. An UPS also provides protection from power surges such as sags, surges, noise, spikes, brownouts or blackouts. When all power runs out, any data in your computer’s random access memory (RAM) is erased.

An UPS contains a battery that “starts-up” when the device senses a loss of power from the primary source. If you are using the computer, in the instance of a power loss from the primary source – the UPS notifies you of the power loss event. This means that you have sufficient time to save any data you are working on and exit gracefully – before the secondary power source, i.e., the battery runs out.

When power surges occur, an UPS intercepts the surge so that it doesn’t damage your computer. A software utility is often provided that automatically backs up or saves any data that is being worked on when the UPS becomes activated.

“High-Availability” power systems require four elements, namely, reliability, functionality, maintainability, and fault-tolerance. Whatever its power level, an UPS is the only way of ensuring a high-quality electrical supply for sensitive computing systems.

Also, with the use of powerful communications programs, today’s UPS device is now able to collect and report on information relevant to the management of UPS – such as, battery charging, remaining operating life, load levels, etc. and relative to their environment, e.g., raised temperature, fires, etc. Similarly, UPS can shut down files by automatic remote control, if there is a failure in the primary power source.

Types of UPS

There are a few types of UPS devices available in the market today as follows:

1. An Off-Line version;
2. A Line-Interactive version; and
3. An On-Line version.



An Off-Line UPS is the typical choice of a user with a standalone PC that uses smaller power loads of less than 10kva. Also known as a standby UPS, this device turns on backup battery power in the event of a power failure.

A *Line-Interactive UPS* protects against the following conditions:

- ◆ Power failure;
- ◆ Power sag;
- ◆ Power surge;
- ◆ Under voltage; and
- ◆ Over voltage.

Additionally, *an On-Line UPS* protects against the following conditions:

- ◆ Switching transient;
- ◆ Line noise;
- ◆ Frequency variation; and
- ◆ Harmonic distortion.

Apart from allowing the server to perform a graceful shutdown in the event of a power failure, a UPS also protects against different power abnormalities which could cause your server to malfunction.

Such a malfunction could cause a terminal hardware failure, or perhaps even write corrupt data to the hard disk. When these problems occur, your PCs suffer from downtime, intermittent lockups, hardware failures, system shutdowns, corrupted files and lost data.

Power problems occur more frequently than most people can pinpoint. According to recent industry studies, power-related problems average nearly one per day even in the most stable utility power supply situation.

If you don't believe that your computer system could be affected so frequently, consider the problem. Many of us don't think much of the unexplained annoyances that seem so common to our computerised age – e.g., system crashes, keyboard lock-ups, or scrambled data, to name a few – as power-related. Yet, they very well may be.

It doesn't take a complete power outage to affect critical equipment and processes. From disk drive crashes to error messages, and unreadable data to perplexing server re-boots, a moment of less than "pure" power can create havoc. Or, at the very least, those exasperating unexplained processing problems!



Vendor Comments

“The UPS market is affected by the general state of the Singapore economy. In Singapore, IT users are more exposed to the fast changing UPS technology. Users now look for scaleable systems with intelligent software to enable the system to be monitored over the Internet and SNMP networks,” said John Chiam, Sales Director for Emerson Network Power Singapore.

“The silver lining in this business is that the public sector is still investing. In the pipeline are infrastructural projects and public institutions. Our edge at Emerson is being able to provide Grid-to-Chip solutions involving AC as well as DC power systems. We can also provide high availability dual-bus solutions for today’s need for continuous uptime.”

“While Singapore’s UPS growth is slightly lower than the rest of the region – at eight per cent – this rate still reflects a strong demand especially for high-capability UPS. This is due to the structural changes in the Singapore economy, as the country moves towards high tech manufacturing industries such as biotechnology. Such industries require high-end UPS,” said Larry Truong, General Manager for ASEAN at American Power Conversion.

“Also, as Singapore begins to position itself as a centre for disaster recovery hub – such as Satyam’s recent investment to build its business continuity centre – the need for UPS will increase.”

Box Story 1:

UPS Basics

Fortunately, there are many kinds of devices available to protect against power problems. These include a growing range of surge protectors, surge suppressors, and uninterruptible power supplies (UPSs).

For many users, UPSs have become the first line of defense against power problems. A UPS is a device that provides protection against short-term power outages by accessing a battery source as backup.

It not only ensures a supply of power in the event of a blackout or brownout, many of the latest UPS systems actually “condition” the power coming into your system right from the utility source.



Therefore, a UPS has the ability to eliminate surges, noise, spikes, and waveform distortions. In other words, this device was designed specifically to deal with many of the common power problems.

That does not mean that every UPS is the same. There are different designs and technologies based on the type of equipment you need to protect; and the amount of power or the load, the unit will be required to handle.

Typically, people with standalone PCs that use smaller power loads (less than 10kva) have chosen a type of UPS known as Off-Line. Also called a standby UPS, this device turns on backup battery power in the event of a power failure.

The next level of UPS protection is Line-Interactive. Its called interactive because, unlike the Off-Line technology, it filters a line current to the power load and converts a trickle of DC power to the battery to keep it fully charged at all times. When the power fails, this UPS doesn't need to turn on, but rather switches from the standard utility source to the backup battery.

The highest level of protection is the On-Line UPS. This UPS is continually charging the battery source so that if the power goes down, backup is instantaneously available, with no start up or switching required.

An On-Line UPS also is designed to deliver other more advanced capabilities. For example, it conditions the power, to eliminate much of the error-causing power disturbances that come in right through the power outlet from the in-house and outside sources.

Box Story 2:

Selecting the Right UPS Solution

Obviously, you need to decide which UPS technology is the right fit for your requirements. This doesn't have to be complicated or time-consuming. You need to understand and consider all the factors involved in selecting and installing a UPS unit that will best serve your needs now, and as your business grows.

Sizing Issues

For a start, you need to determine the correct size of the UPS unit or model that will provide enough protection for your computer needs. Here, the selection criteria of the UPS will depend on the amount of power it is expected to handle.



Another consideration is the nature and the amount of electronics the UPS unit is required to protect.

A third factor is whether the nature of the workload is mission-critical or business-critical.

Generally, small UPS units (less than 6kVA) provide one-to-one protection common to many small networks or for standalone processing on a workstation, server, or computer peripheral. Today, the smaller, lighter models are designed to be quite versatile and advanced such as the ability to “condition” incoming power to prevent surges and spikes.

Many people think exclusively of surge protectors when it comes to protecting sensitive equipment against such kinds of power problems. In truth, the latest UPS technologies incorporate surge protection into the design and provide additional capabilities as well, and can accommodate the latest communications capabilities, including remote, unmanned shutdown and restart operations.

When deciding on the size of your UPS, take into consideration all that it needs to protect. Are data lines involved as well as hardware?

A common mistake is to assume that everything connected to your computer is automatically protected. When sizing your UPS device, make sure of two things to avoid this mistake. These two considerations are:

1. Determine that your UPS of choice is capable of accommodating all appropriate peripherals.
2. Be careful what you plug into the UPS unit. For instance, scanners, printers or coffee machines can cause even the most sophisticated protection device to malfunction, or even fail.

Obviously, there is a far greater amount of data at risk with a network than a single PC. Note that the data on a network is certainly more vulnerable than that of a standalone system. Even a simple LAN configuration can transmit electrical noise among all nodes on a network. Thus, it’s vital to protect each node, in order to protect the data stream.

Switching devices, routers and modems and other connectors must also be considered. Often, network nodes clustered in the same office need to be connected to larger, full-featured UPSs rather than putting a separate UPS on every node.



Finally, look for UPS devices that are endorsed by independent, industry-wide sources such as UL (or United Laboratories). Here, UPS devices that have UL1440 A & B are guaranteed to provide appropriate levels of shielding and therefore are widely accepted for consumer use.

Box Story 3:

FAQ on UPS

What is a UPS?

Generally, a UPS (Uninterruptible Power Supply) is a device that contains batteries to provide backup power to your equipment in the event of a power loss. It connects between a power source, e.g., AC wall outlet, power strip, etc. and an electronic device, e.g., computer, server, phone equipment, etc. – to prevent power losses and disturbances that would affect equipment performance and loss of vital data.

What is a Power Disturbance?

Power can easily become corrupted and contaminated. In addition, utility power is often erratic and produces too little, too much, or no power at all. Whenever any of these problems are induced into the power, we call them disturbances. Power disturbances can cause damage to equipment as well as loss of data, function, and time.

How can a UPS help me?

If it is the right system, the UPS can protect and enhance the performance of connected equipment, as well as provide uninterrupted emergency power in times of power loss.

What is a “Right System”?

Many buyers are confused when choosing a power backup protection solution. Most understand the concept but few understand the details. Understand that most of the products available in the market offer minimal protection.

The “Right System” is one that will provide the following protection:

1. Isolate utility power from connected equipment and supplement low-voltage and over voltage conditions;
2. Filter harmonics;
3. Generate “Perfect sine wave power”;
4. Regulate Output voltages and frequency; and
5. Allow extended backup times for use and shutdown in times of power loss.



What is available?

There are three basic types of UPS technologies offered which are as follows:

Standby: A Standby UPS is often referred to as an Off-Line power supply. With a standby system, power comes directly from an AC outlet until the power is interrupted. After the power fails, a battery-powered inverter almost immediately begins to produce power. Standby units are relatively inexpensive but are often ineffective in providing a pure power source. Prolonged operation in battery mode may cause damage to connected equipment.

Line-Interactive: Line-Interactive UPS units are similar to Standby UPS. However, the unit provides a voltage boost and/or buck (decrease) without accessing the batteries when power supplies dip or increase. Some Line-Interactive units provide minimal protection from power spikes and surges.

On-Line: On-Line UPSs produce the highest quality of power protection by using a double-conversion process that isolates utility power. The UPS takes the incoming AC power and re-generates it continuously through conversion processes. This regeneration process eliminates noise, bumps, or surges before converting the power back to AC.

Since power runs continuously through the inverter, it is always On-Line and there is no transfer or switching time to battery mode in the event of a blackout. The quality of an On-Line UPS system can be rated by the quality of output power, efficiency, and backup time it provides.

How long can equipment keep running on an UPS?

The duration of time that equipment can keep running on an UPS is determined by the quality, efficiency, and features of the UPS systems as well as the amount of equipment connected to the UPS.

About the Author

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