



Server Technology, Inc.

Smart Load Shedding ensures Uptime

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INTRODUCTION

Uptime or zero down time is the key driving factor in today's data center design and operation with companies measuring downtime in thousands of dollars per minute when a system is not available. Many companies operating Tier III and Tier IV data centers also manage remote sites and co-location facilities that are just as critical as their main location. Managing both remote and co-location facilities requires new innovative solutions to ensure uptime. One such solution is using intelligent Cabinet Power Distribution Units (CDU's) capable of providing Smart Load Shedding capabilities. Smart load shedding allows the operator to load shed based on three key operating parameters; 1) whether the UPS is on battery, 2) the temperature level or 3) the current load. These key parameters allow the user to automatically shed designated, non-critical, devices based on one or all of these conditions ensuring uptime and avoiding damage to the critical devices within the cabinet should a problem occur.

There are different approaches on the market today for providing load shedding. This article focuses on the unique advantages of using an intelligent CDU to provide smart load shedding capabilities based on specific critical parameters within the cabinet. This new technology greatly increases uptime and avoids equipment damage.

LOAD SHEDDING USING A UPS

Load shedding is designed to provide longer operational life by shutting down non-critical devices whenever the UPS goes on battery, allowing the remaining units to operate longer. Typically, load shedding is accomplished by using a UPS with this functionality but this solution has limitations as it does not allow shedding down to the individual outlet level. As one UPS output typically powers multiple devices not allowing it to actively control all of the devices throughout the cabinet. Also, a UPS does not allow load shedding based on the temperature levels in the cabinet or the current load of a specific drop or whip in the cabinet. To have complete control of all of the devices in the cabinet, load shedding using a switched CDU is a more flexible and comprehensive solution.

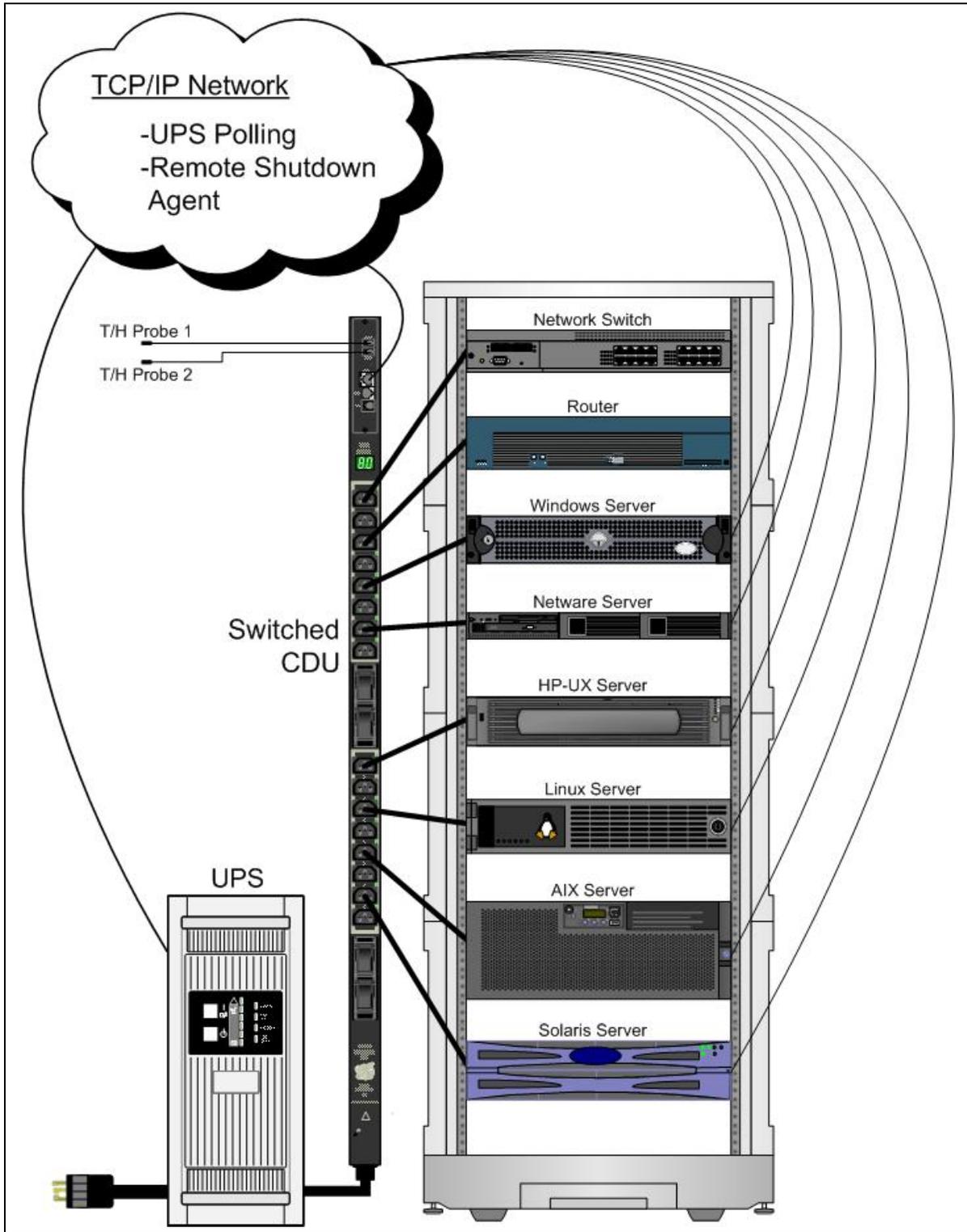


Figure 1
Smart Load Shedding Installation

SMART LOAD SHEDDING- BY UPS CONDITION

A switched CDU in communication, via SNMP, with one or more UPS's knows when the UPS goes on battery and can automatically shed non-critical devices when this condition occurs (**See Figure 1**). Since a switched CDU is capable of load shedding down to an individual outlet, complete control is achieved over all the devices in the cabinet. Also, since the CDU knows when a device is going to be shed notification can be sent to a specific device, via a remote shutdown agent, to ensure that a graceful shutdown is achieved before power is cutoff. This is important for devices like servers that may not properly handle a hard reboot and ensures that when power is restored that the server will come back up in good operating condition. These remote shutdown agents are widely used and accepted, work in conjunction with the CDU, and guarantee uptime by shedding less critical devices and ensuring power is available for critical applications.

Server Technology has the ability to support Smart Load Shedding for UPS devices from 9 different manufacturers including: APC, Liebert, MGE, Tripp Lite, HP, Minuteman, Mitsubishi, Powerware and Toshiba. In addition, it also supports any manufacturers UPS that supports the Generic RFC 1628 UPS SNMP specification.

SMART LOAD SHEDDING- BY TEMPERATURE CONDITION

Automatically load shedding devices based on the temperature measurement in the cabinet is the best way to ensure uptime and avoid damage to equipment if the cooling system fails. For example, if cooling is lost in a 5 kW cabinet it can take less than a minute before temperature reaches a critical level. Usually the reaction time of the facility is much longer than the time it takes to damage IT equipment (**See Table 1**). This is especially true in remote locations or a small number of cabinets installed in a room that relies on a stand alone cooling unit like many of today's IT equipment closets or remote sites. UPS's do not measure temperature and therefore do not provide load shedding based on temperature where switched CDU's easily allow multiple temperature measurements with probes that can be placed exactly where the operator needs to know the temperature reading. Temperature and Humidity information is available several ways on a switched CDU including through an integral web interface and through SNMP traps. Smart Load Shedding allows load shedding based on two different temperature probe measurements located within 10 feet of the CDU.

TABLE 1

Time to critical temperature rise	
W/ft²	Time
40	10 minutes
100	3 to 5 minutes
200	1 to 3 minutes
300*	Less than a minute
* 4.5 kW in 15 ft ² , single cabinet in typical Cold Aisle/ Hot Aisle arrangement	

Note: From Data Center Forum: Power & Cooling Issues, Dr. Robert Sullivan, "Dr. Bob", Triton Technology Systems, October 12, 2006

SMART LOAD SHEDDING- BY CDU LOADING

Switched CDU's measure the true RMS current level and provide this information via a local LED display, through a web interface and allows the ability to set SNMP traps if specific thresholds are exceeded. RMS current load measurement is a common CDU function that has existed for some time. If an over current condition arises based on a device becoming damaged such as a bad power supply or if a new device has been installed on a circuit exceeding the threshold current level, automatic load shedding is a much better option than running the risk of over loading a branch circuit and losing power to all of the devices associated with that branch. If the branch circuit over current protection devices are circuit breakers and selective coordination is not achieved, then an over current condition will often result in a power loss of all devices on the CDU, as not only will the branch circuit breaker trip but the upstream breakers will trip as well.

REMOTE SHUTDOWN AGENT- GRACEFUL SHUTDOWN

Event based load shedding i.e. UPS status, current level and temperature, is enhanced by the use of a remote shutdown agent. This agent resides on the server and provides a graceful shutdown by letting the server know that it is going to be shutdown and giving the server enough time to run any scripts or perform other operations that are required before the shutdown occurs. This remote shutdown agent is independent of load shedding and a CDU that is capable of working with a remote shutdown agent can provide a graceful shutdown of servers during a standard remote re-boot, if say a server is locks up, or if the other event based conditions occur. The remote shutdown

agent provided by Server Technology Inc., has been honed over 15 years of experience with UPS management and server shutdown software. It is capable of operating with many operating systems including Windows, Linux (Red Hat), SLES, HP-UX, Sun Solaris, Novell Netware and IBM AIX and is currently being used in tens of thousands of installations.

AUTORECOVERY- FROM LOAD SHEDDING

When the specific threshold is no longer being exceeded or the UPS comes off of battery, a user configured autorecovery can restore power to the previously load shed devices. This feature is fully configurable and it is up to the operator if the system will be allowed to autorecover on none or all of the configured key parameters i.e. temperature, current load, or if the UPS is back on main power.

CONCLUSION

Even with the best data center design, infrastructure and support, situations will arise that threaten uptime. Implementing switched CDU's with Smart Load Shedding technology ensures that problems like loss of power to the UPS, cooling problems or over current conditions won't affect your ability to continue critical operations. Also, knowing that these controls are active 7 x 24 x 365, and will quickly respond to resolve any problems certainly provides piece of mind.