Sentry™ Power Tower

Enhanced Diagnostic Features & Support to Benefit Network Hardware Devices in Internet Data Centers

This paper provides an overview of three Sentry Power Tower Benefits:

Benefit 1 -- Power Tower Power-On Sequencing
Benefit 2 -- Power Tower Load Current Measurement
Benefit 3 -- Power Tower Remote Power Control

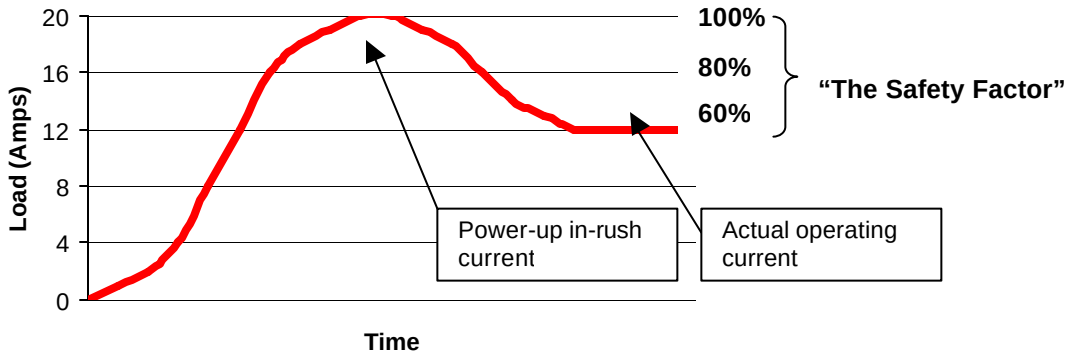
Introduction

New Internet Data Centers located directly on the Internet backbone are an extremely attractive solution that permits customers to locate their mission-critical equipment with direct access to high-speed fiber optic links. In addition to cage and rack space and Internet connectivity, the Internet Data Center provides the customer with Power-Drops to power his equipment located in each of his racks, cabinets and/or cages.

The Power Drop -- One or more Power Drops is distributed to each rack, cabinet or cage in the Internet Data Center. Assume a Data Center customer acquires a 20-amp Power Drop from the provider. A typical cost for the 20-amp Power Drop is $420 per month. While the customer is billed for the entire 20-amp circuit per month, the "Safety Factor" requires that the customer limit its utilization of the available Power Drop to allow for in-rush current at time of power-up.

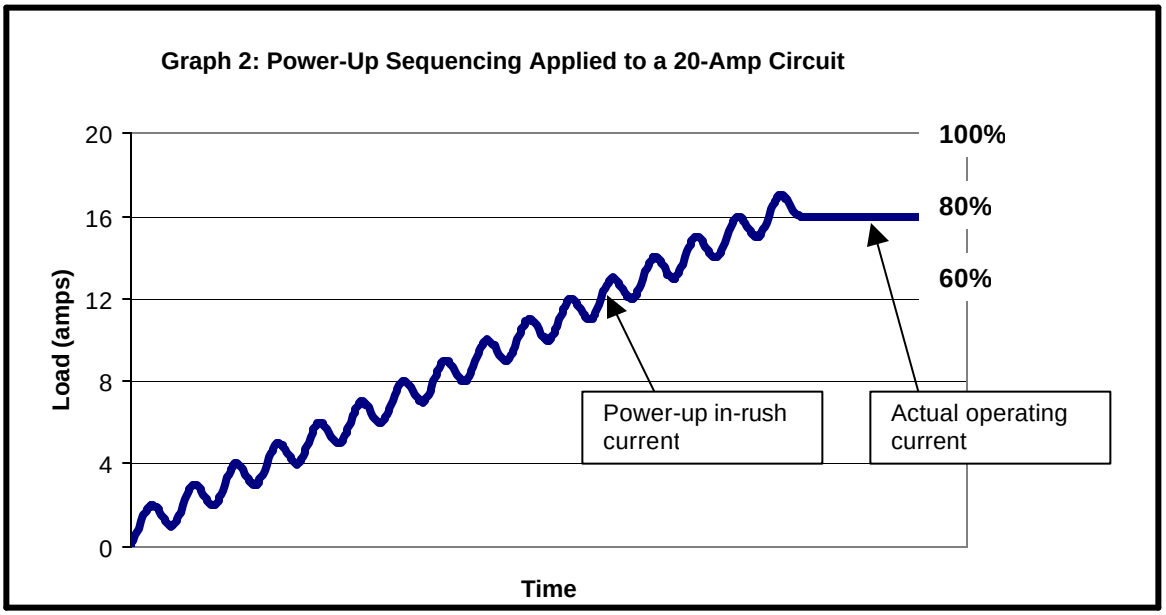
The Safety Factor – Servers, routers and other internetworking devices require a smaller current load during "normal" operational activity than during boot-up procedures. This high-current draw during boot-up is referred to as the "power-up in-rush current." Standard industry practice among Internet Data Centers permits the customer to load each Power Drop at 60 percent of its total value. For example, a customer can load the 20-amp Power Drop to 60 percent of its value, or 12 amps. This 12-amp load guideline permits all the equipment in the rack or cabinet to power-up simultaneously with a Safety Factor of 8 amps (40 percent of the 20-amp current). The Safety Factor allows for the power-up in-rush current to occur without causing the circuit breakers to trip on the Power Drop or the fuses to blow in the Internet Data Center (see Graph 1).

Graph1: Safety Factor Applied to a 20-Amp Circuit



Benefit 1 -- Power Tower Power-On Sequencing

Power-On Sequencing eliminates the in-rush current problem. When power is applied to the Power Tower, each of the 16 power receptacles receives power sequentially, with a 2 or 4 second delay between each receptacle. Rather than all 16 outlets powering-on at once -- with all 16 devices reaching peak in-rush current levels at the same time -- Power-On Sequencing distributes power to the outlets in sequence, form the first to sixteenth outlet. This averts the potential of a blown fuse or tripped circuit breaker in the Data Center. A direct benefit of Power-On Sequencing allows the Power Drop to be loaded at 80% of capacity (16 amps) versus 60% (12 amps) – and still leaving 20% of capacity for an errant power spike. With the sequenced boot-up of each outlet's connected device, the Power Drop receives 16 separate power-up in-rush currents, rather than one peak power-up in-rush (see Graph 2). Graph 2 provides an example of 16 devices drawing one amp each during normal operation, and each device generating a power in-rush during boot-up procedures.



What is the benefit of an additional 4 amps? Assume a customer has a number of servers that draw a total of 32 amps. This would probably require three 20-amp Power drops: 12 amps on the first Drop, 12 amps on the second Drop and 8 amps on the third Drop. Total cost for this scenario: $420 per Drop, and three Drops cost $1,260 per month.

With Power Tower Power-On Sequencing, the servers could be supported on two Power Drops: 16 amps on the first Drop and 16 amps on the second Drop. **Total cost equals $420 per Drop, and two Drops would be $840 per month.** (A savings of $420 per month and $5,040 per year. Using this savings alone, the breakeven point for a Power Tower is less than 6 months.)

Benefit 2 -- Power Tower Load Current Measurement

Load Current Measurement allows the Internet Data Center's support team to monitor the load in amps on each Power Drop. The Load Current feature provides multiple benefits in the Data Center.

First**, for the on-site engineer** who is installing the servers and attaching the power cords to the Power Tower's receptacles, a two-character digital display located on the face of the Power Tower shows the cumulative load in amps. This accurate measurement allows the on-site engineer to install a configuration of equipment with a total draw up to 16 amps (80% of a 20 amp load).

For the engineer at the Network Operation Center, a standard browser can be used to check on each Power Drop to determine the load in amps. This is especially useful because the customer may have un-intentionally added new cards to a network equipment unit or added new servers to the same Power Drop and the load may exceed 16 amps (or 80% of the capacity).

For the NOC, Load Current Measurement provides an accurate measurement of the total load for the data center. This data is used to forecast future power facility enhancements and to forecast future air conditioning requirements.

For the customer, a standard browser can be used to check on each Power Drop to determine the load in amps, allowing the customer to determine if they are at maximum capacity or under-utilizing each individual Power Drop.

In addition, threshold parameters can be configured within the Power Tower. Whenever the power load in amps exceeds the threshold, an SNMP trap will be executed notifying the NOC that a specific Power Drop is being overloaded. The Power Tower allows the **SNMP traps to be directed to two locations**. For example, the SNMP trap can be sent to the NOC center and also to the local data support staff.

Benefit 3 -- Power Tower Remote Power Control

Remote Power Control enables remote reboot procedures of servers and internetworking devices via TCP/IP, out-of-band or serial access. Equipment installed within the Internet Data Center in relay racks or equipment cabinets may be network equipment units such as a routers and switches, or mission critical servers. Regardless of the combination and configuration of the equipment in the rack, all this equipment has a common characteristic: all this equipment runs via an operating system. Software-based Operating Systems *do* encounter systems failures and *will* lock-up. The first and most proven problem recovery step is to perform a power-cycle reboot. The communication interfaces to the Power Tower (RS-232, Out-of-band, Telnet, SNMP or HTML) allows the NOC (or the customer) to immediately reboot an inoperative server or router.

Using the Sentry Power Tower, a network engineer or the customer can perform essential operations to remote equipment: power on/ off individual equipment units, reboot a locked-up device or reboot an entire rack in sequential order for regular maintenance. The recovery to a locked-up device is fast and effective and eliminates the need to dispatch a field technician for manual intervention.

The network operation benefits are significant. For the Data Center, benefits include increased SLAs and eliminating the need to dispatch engineers to an on-site location. For the customer, benefits include minimizing downtime and maximizing productivity and revenues**.**

Power Tower Benefits Summary

ACTION	BENEFIT
Increased capacity on a Power Drop – [1] Using Power-On Sequencing, requires fewer Power Drops (refer to example in Benefit #1)	$5040 per year
Load Current Measurement – [2] Eliminate un-necessary circuit breaker failures	$500 per year
Remote Power Control - [3] Eliminates on-site visits and increased SLAs	$1000 per year
Load Current Measurement – [4] Improved power and air conditioning power requirements	$1000 per year
Reduced hardware requirements – [5] Eliminates the need for additional power distribution strips	$200
TOTAL BENEFIT	**$7740 per year**
[6] Power Tower Cost	$2200
Break Even Analysis	**3.5 Months**

Assumptions
(1) refer to example in Benefit #1 – allows existing Power Drops can be re-sold to additional customers
(2) Assumes Internet Data Center's costs associated with resetting circuit breaker or replacing blown fuse (includes man-time to reset breakers and customer equipment)
(3) Assumes site visits and SLA penalties from downtime cost the Data Center $500 per incident (2 incidents)
(4) Assumes reduced demand on quantities of Power Drops inside the Data Center
(5) Assumes 2 power distribution strips per rack @ $100 per
(6) Assumes 2 Power Tower strips (32 outlets) per rack or cabinet