FOUR SECRETS TO AVOIDING DATA CENTER DOWNTIME
FOUR SECRETS TO AVOIDING
DATA CENTER DOWNTIME

2 INTRODUCTION
3 POWER GENERATION & DELIVERY SYSTEMS
4 BREAKER TRIP ON FAILOVER
5 BREAKER TRIP DURING RESTART
6 POWER LOSS ON SINGLE-CORDED GEAR
7 EXCESSIVE POWER CHARGES THROUGH UNDERUTILIZATION
Modern data centers utilizing dual power designs have further increased reliability of IT systems by ensuring reliable power distribution and delivery.

However, improper implementation can negate or diminish the effectiveness of dual power designs. The key is understanding power generation and delivery systems while avoiding these four major design failures.

To standardize a design for dual-powered computer products and simplify the decision making process for choosing computer equipment for mission critical applications, the Uptime Institute published “Fault-Tolerant Power Certification Is Essential When Buying Products for High-Availability.”

Unfortunately, simply buying dual-powered gear is not enough to ensure high availability.

To fully understand dual power systems, also referred to as A-B power, it is necessary to understand the power generation and delivery systems responsible for delivering dual power in data centers.
Data centers designed and built utilizing Tier IV requirements are by definition “concurrently maintainable,” which means any system or component in the data center may be shut down for maintenance or may fail without affecting the delivery of services to the end user.

In the case of a dual-powered data center, this typically is achieved by delivering at least two power circuits to each cabinet, one from the A power source and one from the B power source.

If every piece of computer equipment is outfitted with dual power supplies (or A-B switches), the load will continue to run normally even if one of the power sources is shut down for maintenance. The circuits must be properly sized and deployed.

Failure to properly design, size and implement dual power infrastructure at the cabinet may lead to one of the following outcomes:

- Breaker trip on failover
- Breaker trip during restart
- Power loss on single-cored gear
- Excessive power charges through underutilization
PREVENTING BREAKER TRIP ON FAILOVER

In a dual system, power is supplied to the cabinet utilizing a whip, a flexible conduit with an attached outlet on one end that is hardwired into a power distribution unit (PDU) or breaker panel. These whips are typically sized in increments of 10 amps such as 20 amp, 30 amp, etc.

In the data center industry, the standard allowable load on a whip is eighty percent (80%) of the breaker rating. For example, a 20 amp A-B whip pair would be limited to 16 amps (see example).

When a breaker is tripped during failover, it’s usually caused by doubling the number of servers without accounting for power load. The 20 amp A circuit is loaded to 16 amps and the B circuit is also loaded to 16 amps.

If power circuit B fails or must be de-energized for maintenance, the A power circuit in all 16 servers will be required to deliver twice the power to the server – for a total input load of 32 amps on a 20 amp power circuit.

Remember…8 servers, each server needs 2 amps and only one power supply is now energized per server. This is within the 80% breaker rating design criteria, so this example is within the design specification.

Setting up A-B Power to Prevent Breaker Trip on Failover

A server cabinet contains eight servers, each with dual power supplies consuming 2 amps per server at full running load.

If a 120 volt, 20 amp A-B power whip pair is delivered to the cabinet the load will be distributed as follows:

Power Circuit A – 8 amps (with both A-B circuits active)
Power Circuit B – 8 amps (with both A-B circuits active)

Total power draw for the A and B circuits is 16 amps. If power circuit B fails or must be de-energized for maintenance, the A power circuit in all eight servers will be required to deliver twice the power to the server – for a total input load of 16 amps on a 20 amp power circuit.

Remember…8 servers, each server needs 2 amps and only one power supply is now energized per server. This is within the 80% breaker rating design criteria, so this example is within the design specification.
Improperly loaded circuits may support a running load in a failover situation, but the restarting of connected servers during single source operation could then trip the upstream circuit breaker (thereby causing momentary starting loads as drives spin up).

Most thermal magnetic breaker manufacturers recommend limiting current through the breaker to 80% of the breaker rating. Limiting the total load for an A-B whip pair to 80% is an essential element of dual power distribution design.

This margin of safety allows for surges of power to the load often experienced on start up of certain devices or other unforeseen momentary loads. The 80% rating is a time versus temperature relationship, so the breaker is able to handle the start up surge for a limited time, after which the loads returns to normal.

The total load on both power whips should be distributed evenly between the circuits and the total of those two loads should not exceed 80% of the breaker rating.

In a failover situation with one power circuit inoperative, the running load for one circuit in the example in the previous section “Preventing Breaker Trip on Failover” would be 16 amps. If one of those devices were a large RAID array, the starting current could easily exceed 200% of the running load and exceed the breaker rating, thereby causing a breaker trip and resulting downtime.
PREVENTING POWER LOSS ON SINGLE-CORDED GEAR

Single-corded gear will require an automatic transfer of A-B switch to protect the device. Failure to do so during the design phase may lead to power loss and resulting downtime.

Legacy servers with single power supplies may be performing mission critical functions today, but are destined for upgrades. Until those upgrades are complete, they’re still required to be in service. This is also true of many mid-range network devices such as firewalls, network clocks or NTP servers, and even some edge switches.

These single power supply devices can still be used with reliability by utilizing automatic transfer switches, commonly called Automatic Transfer Power Distribution Units (PDU).

These low-cost devices are typically rack mountable and occupy one rack unit (1U) of space. They feature dual input cords and are able to switch from one power circuit to the other in a few micro seconds when power failure is detected on one of the input leads.

This transfer time is typically well within the specification of most devices, so the blip is not seen by the load. The power fails, the load transfers and the attached devices continue operating normally.

Once power returns, everything returns to normal. The same design criteria must be observed with the automatic transfer switches as dual power supplied computer devices. Limit the loads to 80% of the breaker rating and split that 80% evenly between the two power circuits.
EXCESSIVE POWER CHARGES THROUGH UNDERUTILIZATION

Failing to fully utilize or “load” power circuits to their rated capacity may not result in downtime, but could inflate power subscription costs.

Avoid excessive power charges from underutilization through proper power planning and budgeting. This involves loading every circuit to the rated capacity while respecting safety margins.

IF POWER CIRCUITS ARE NOT FULLY LOADED, COLOCATION CUSTOMERS END UP OVERPAYING FOR ELECTRICITY.

Many colocation providers deliver power on a subscription basis. In a dual-powered data center, the customer pays a flat rate per A-B whip pair. This rate is calculated based on a proportionate cost for the infrastructure required to condition and distribute the power, as well as the electricity consumed at the full 80% load rating.
While underutilization may sound like an easy pitfall to avoid, in application, it is often ignored. This is especially true when migrating from a legacy-owned facility to a modern colocation facility. Customers simply specify a set number of circuits for each cabinet while neglecting to analyze and evaluate their exact needs.

This can be a costly mistake. It results in leasing more square footage than is absolutely necessary to support the load at the facility’s design power density, while paying for subscribed power that is never used.

Another common pitfall is specifying the number of required circuits based on the number of PDUs or power trips in the cabinets. Data center power circuits are an expensive way to handle power distribution and care should be used to order only what is required.

For gear with low power requirements...

Solve the dilemma of loading each circuit to its rated capacity by using a whip with additional receptacles.

For example, a 30 amp whip can be outfitted with multiple receptacles in a double gang box. This could provide an economical way to deliver power to multiple cabinets. Take caution to monitor the power usage to ensure correct amperage on the whip.
ABOUT FIBERTOWN

FIBERTOWN is the premier Tier IV-designed data center and business continuity campus located 100 miles northwest of Houston in Bryan/College Station.

DATA CENTER & COLOCATION SERVICES
FIBERTOWN offers organizations along the Gulf Coast peace of mind that their mission critical applications and IT infrastructure are protected and running 24/7/365. From pre-configured pods to cabinets and cages, FIBERTOWN features the latest in data center design, including:

- Fault-tolerant A-B-C power
- High availability N+1 cooling
- Fully redundant, carrier-neutral connectivity
- “24 by forever” Network Operations Center
- SAS 70 Type II audited

BUSINESS CONTINUITY CAMPUS & DR OFFICE SPACE
Companies also trust FIBERTOWN to design, build and manage hot worksites, ready to activate at a moment’s notice. Disaster recovery procedures are crucial to organizations along the Gulf Coast. When business must go on, FIBERTOWN’s DR office space solutions make sustaining operations quick, secure and reliable.

Corporate Office
2501 Earl Rudder Frwy, South
College Station, Texas 77845
979.393.9100
info@fibertown.com
www.fibertown.com