FIBERTOWN

Four secrets to avoiding data center downtime

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Introduction

Modern data centers using dual-power design have increased IT system reliability. However improper system implementation can negate or diminish the effectiveness of the dual-power configuration.

The key to avoiding downtime is understanding power generation and delivery systems and avoiding these four major design failures.

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

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.*

Objective

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.

“During Hurricane Ike, [Kelsey Seybold] lost its data center for a period of time… We were very attracted to FIBERTOWN from the aspect of being able to have the kind of uptime we need.”

Martin Littman, Chief Technology Officer, Kelsey Seybold Clinic

Proper distribution planning is required to achieve the ultimate goal of zero downtime.

What makes a data center concurrent?

Concurrently maintainable data centers can have any system or component within the data center shut down for maintenance, or fail, without affecting the delivery or services to the end user.

What are dual-powered data centers?

Dual-powered data centers delivery at least two power circuits to each cabinet, one from power source A and another from power source B.

If the customer's equipment is outfitted with dual-power supplies, or A-B switches, the load will continue normally, even if one of the power sources is shut down for maintenance. Both circuits must be properly sized and deployed.

Failure to design, size and implement dual power infrastructure at the cabinet may lead to:

- breaker trip on failover
- breaker trip during restart
- power loss on single-corded gear
- excessive power charges through underutilization

Dual systems explained

In a dual-power system, power is supplied to the cabinet using a whip, which is a flexible conduit hardwired to a Power Distribution Unit (PDU) or breaker panel. Whips are typically sized in units of 10 amps.

In the data-center industry, the standard allowable load for a whip is **80 percent** of the breaker rating. For example, a 20-amp whip would be limited to 16 amps.

Example:

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
- 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.

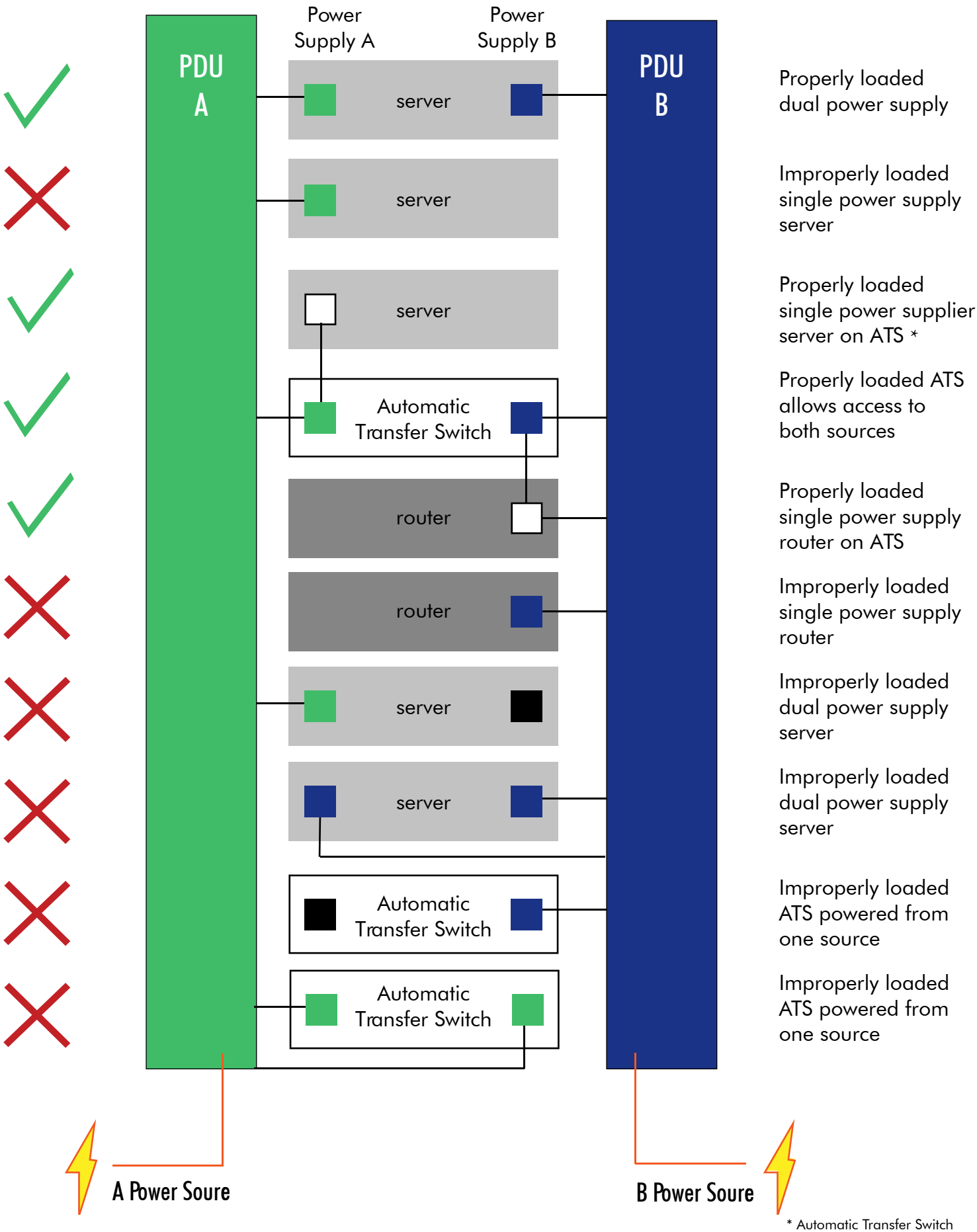
Remember: Each of the servers needs 2 amps and only one power supply is energized per server. The example is within the 80 percent breaker rating design criteria, making it within the specification.

Preventing breaker trip during failover requires understanding your specific power load and accounting for balance in your dual-power design.

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: A total input load of 32 amps to a 20 amp power circuit. In this scenario, the breaker will trip and the servers will go down.

Power Distribution Scenarios



Properly loaded dual power supply

Improperly loaded single power supply server

Properly loaded single power supplier server on ATS *

Properly loaded ATS allows access to both sources

Properly loaded single power supply router on ATS

Improperly loaded single power supply router

Improperly loaded dual power supply server

Improperly loaded dual power supply server

Improperly loaded ATS powered from one source

Improperly loaded ATS powered from one source

* Automatic Transfer Switch

Improperly loaded circuits may support a running load in a failover situation, but restarting connected servers during single-source operation could trip the upstream circuit breaker.

Preventing trip on restart

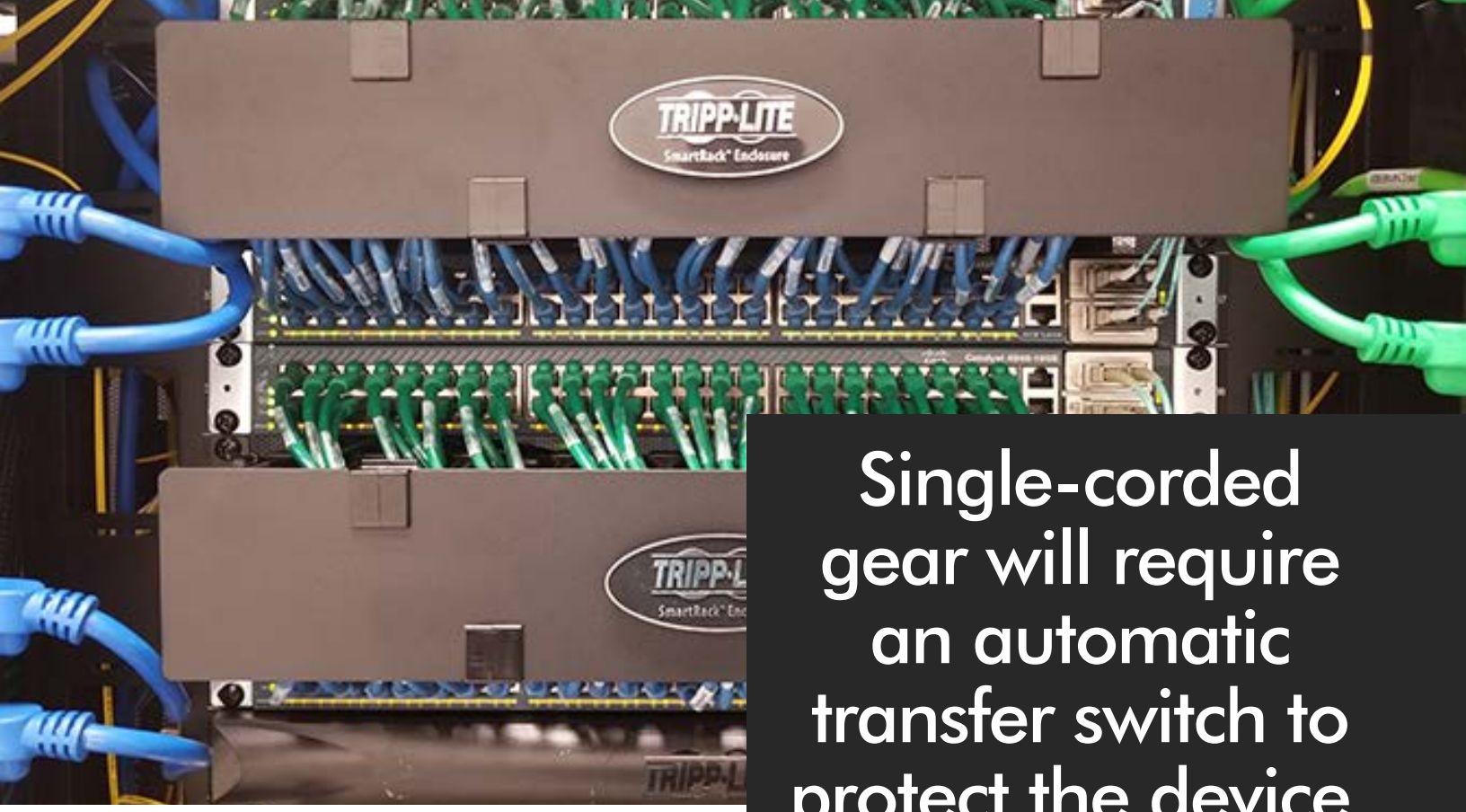
Most thermal magnetic breaker manufacturers recommend limiting current through the breaker to 80 percent of the breaker rating. Limiting the total load for an A-B whip pair to 80 percent is an essential element of dual power distribution design.

This margin of safety allows for power surges to often experienced on start up or other unforeseen momentary loads. The 80 percent 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 return 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 percent of the breaker rating.

In a failover situation, with one power circuit inoperative, the running load for one circuit in the example on Page 3 would be 16 amps. If one of those devices were a large RAID array, the starting current could easily exceed **200 percent** of the running load and exceed the breaker rating, thereby causing a breaker trip and resulting in downtime.

The 80 percent rating should always be followed for safety and additional margin.



Single-corded gear will require an automatic transfer switch to protect the device.

Power loss on single-corded gear

Single-corded gear will require an automatic transfer 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 should be upgraded. This is also true of many mid-range network devices such as firewalls, network clocks or Network Time Protocol (NTP) servers as well as 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 (ATPDU). 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 microseconds 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, the system 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 percent of the breaker rating and split that 80 percent evenly between the two power circuits.

Underutilization and excessive charges

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 percent load rating.

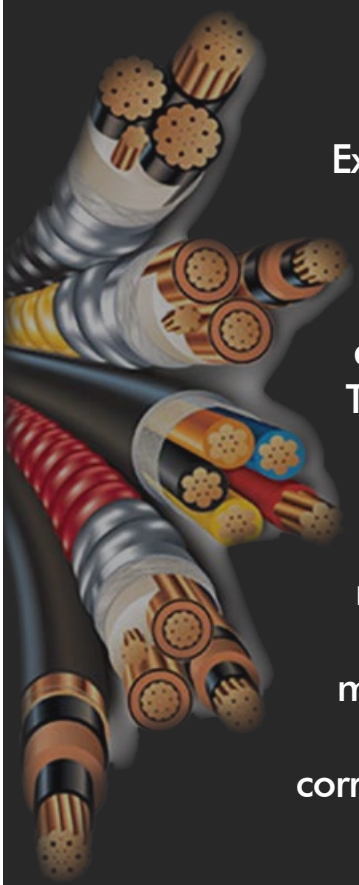
While underutilization may sound like an easy pitfall to avoid, in application, it is often ignored. This is especially true when migrating from a legacy-owned facility to a modern colocation facility. Customers simply specify a set number of circuits for each cabinet while neglecting to analyze and evaluate their 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.

Example:

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

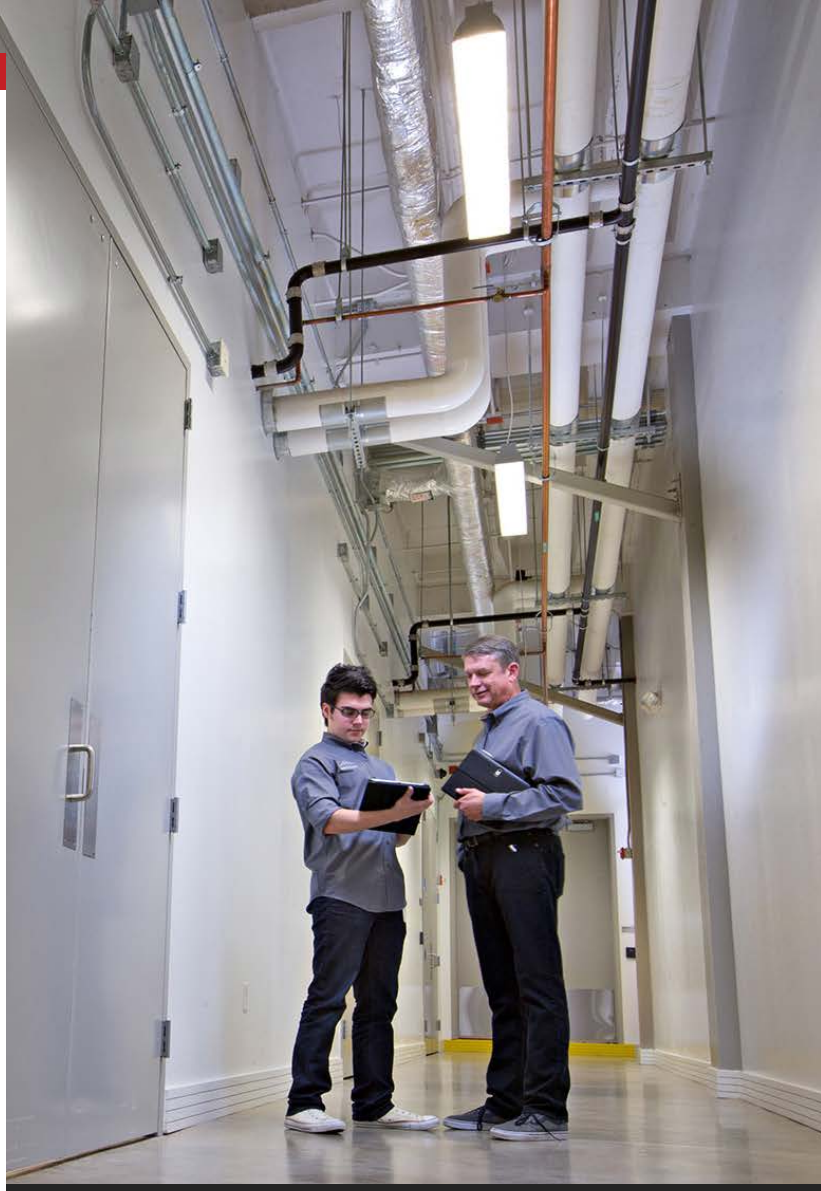


Ex: A 30 amp whip can be outfitted with multiple receptacles in a double gang box. This could provide an economical way to deliver power to multiple cabinets. Take caution to monitor the power usage to ensure correct amperage on the whip.

FIBERTOWN is Texas' premier provider of resilient, high-availability production and secondary colocation data centers, as well as award winning dedicated disaster recovery and business continuity office space.

With locations in Houston and Bryan-College Station, Texas, the SSAE 18 SOC 2 compliant data centers offer carrier neutral, fault-tolerant 2N power and cooling and fully redundant multi-carrier internet connectivity with a 100% uptime Service Level Agreement (SLA).

Fortune 500 companies and mid-size organizations along the Gulf Coast rely on FIBERTOWN to design, build and manage custom disaster recovery office space. FIBERTOWN's business continuity solutions are backed by our concurrent and redundant data centers with hot connectivity to multiple Tier 1 carriers and 100 % guaranteed uptime.



2
Network Operations Centers

2-200
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2N
Power and cooling