

# Secure Data Center Design and Supporting Controls

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# Overview



**Consider basic standards for data center design**

**Review design resilience levels for availability classes**

**Enumerate design resilience levels related to protection classes**

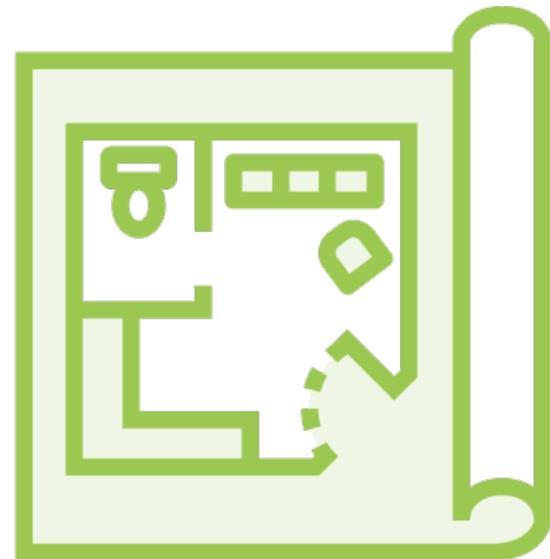


# Data Center Design Standards

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# Reviewing Logical Design for a Data Center



**Cloud consumers generally not building data centers**

**Knowing standards is helpful**

**May assist with compliance issues**



# Tenants of Logical Design

**Measures to limit access**

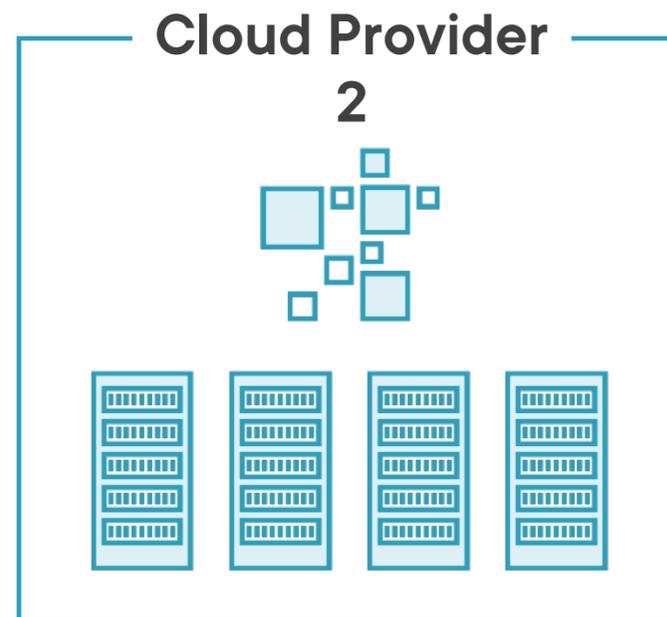
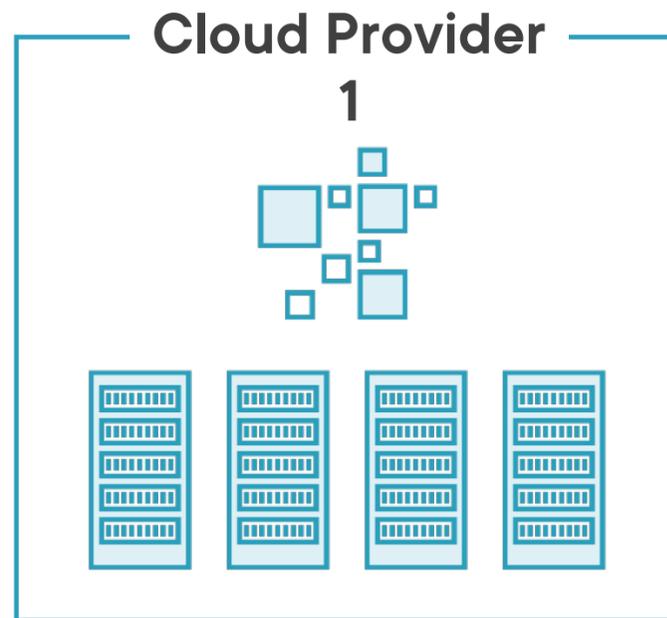
**Expressed in business terms**

**Included business requirements**

**Precedes physical design**



# Functional Security Requirements



**Two or more CSPs may be needed**

**Data formats and techniques often proprietary**

**Consider portability and interoperability**



# ISO/IEC 22237 Data Center Facilities and Infrastructures

**Location  
recommendation**

**Power distribution**

**Control systems**

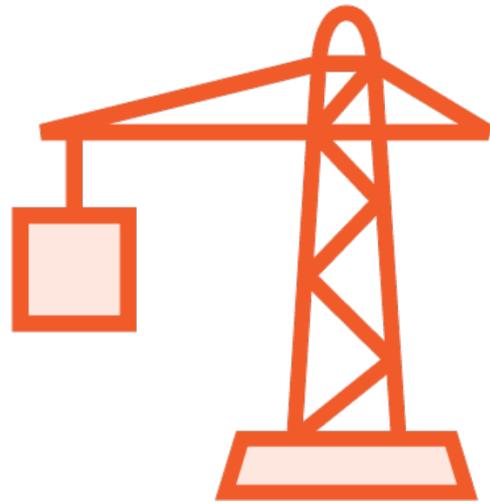
**Monitoring and  
security**

**Security for  
protection class**

**Operational and  
management**



# Location and Site Selection



**Building construction**

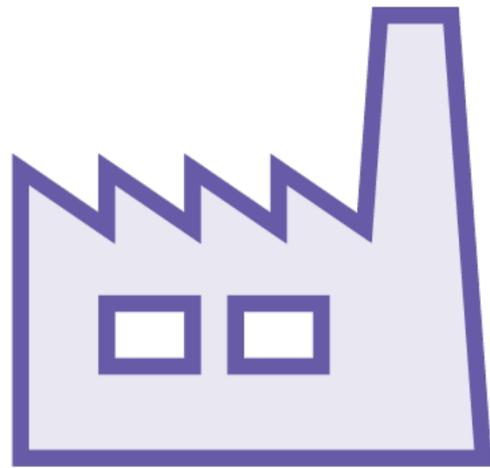
**Building configuration**

**Fire protection**

**Quality construction measures**



# Environmental Impact



**Brownfield/Greenfield impact**

**Understanding carbon footprint**

**Renewable energy**



# Major Cloud Providers Climate Sensitivity

## Amazon

Became the world's largest corporate purchaser of renewable energy

## Google

100 percent of global electricity is renewable energy.

## Microsoft

Multifaceted 2030 plan of firsts aimed at reducing

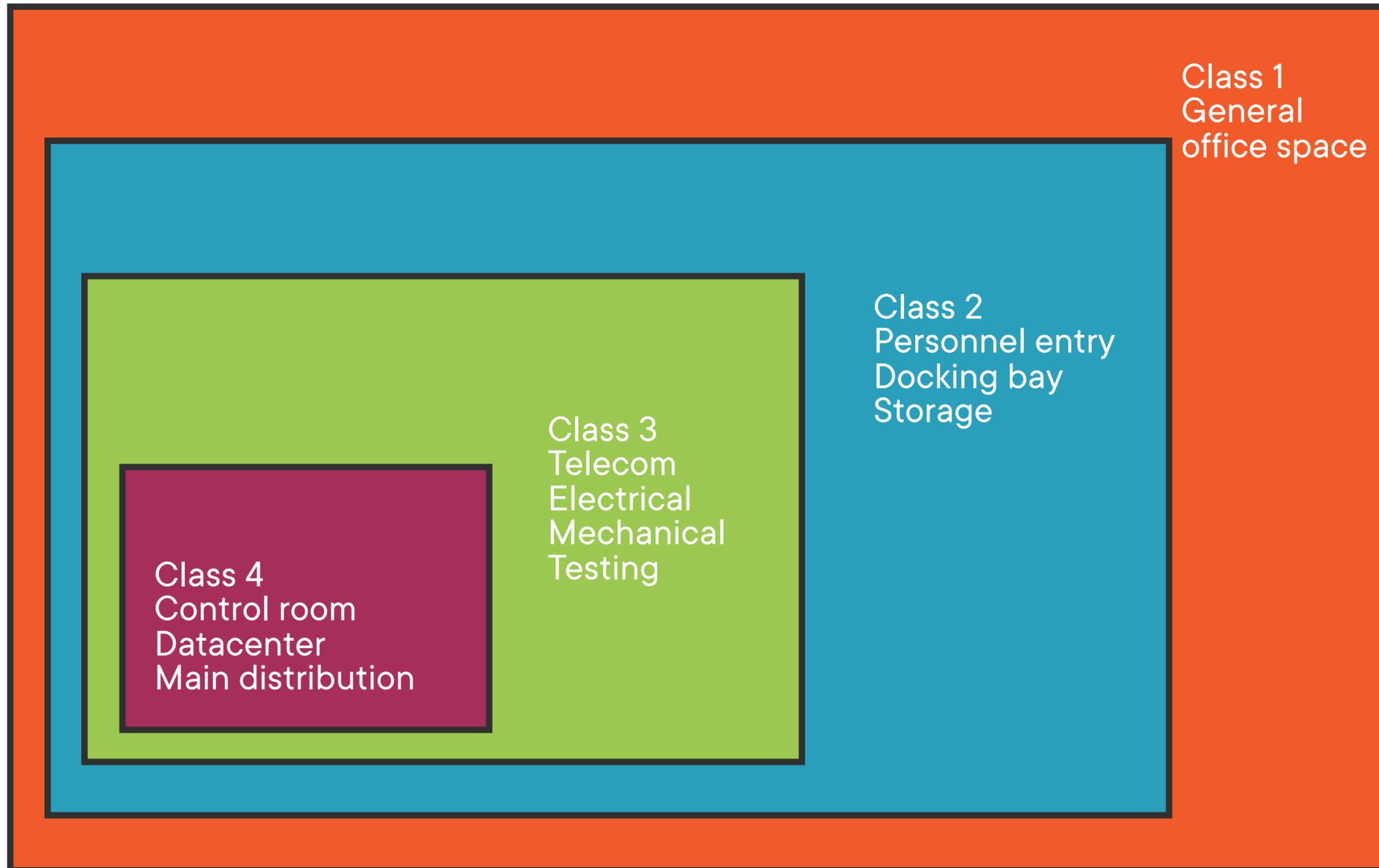


# Design Resilience – Protection Classes

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# Four Classes of Protection



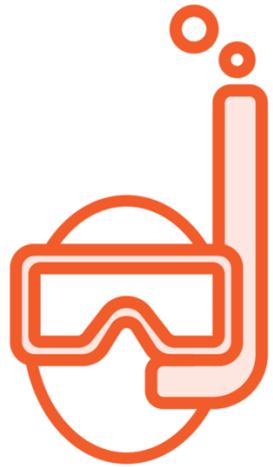
# Design Resilience - Fire Suppression

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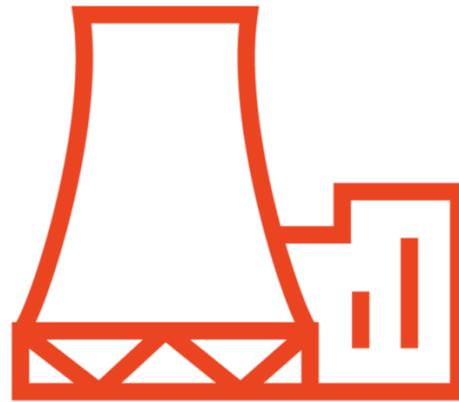


# Fire Suppression

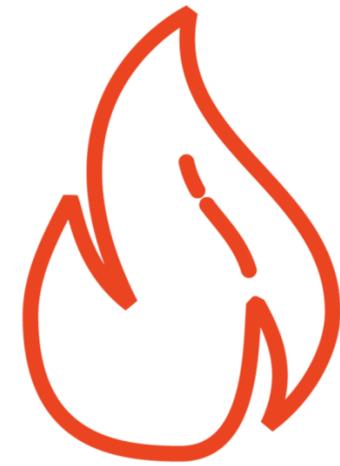
## To Survive a Fire Needs



Oxygen



Fuel



Heat



# Fire Detection



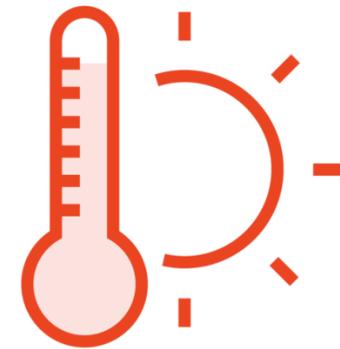
## Flame Detection

Flame detectors use photoelectric: infrared, visible light, and ultraviolet



## Smoke Detection

Smoke detectors use ionization and photoelectric



## Heat Detection

Heat detectors rate-of-rise and fixed-temperature



**Gas**  
**FM-200**  
**Argonite**  
**Aero-K**  
**Foam**  
**Water**



# Water-based Suppression in Data Centers

Dry-Pipe

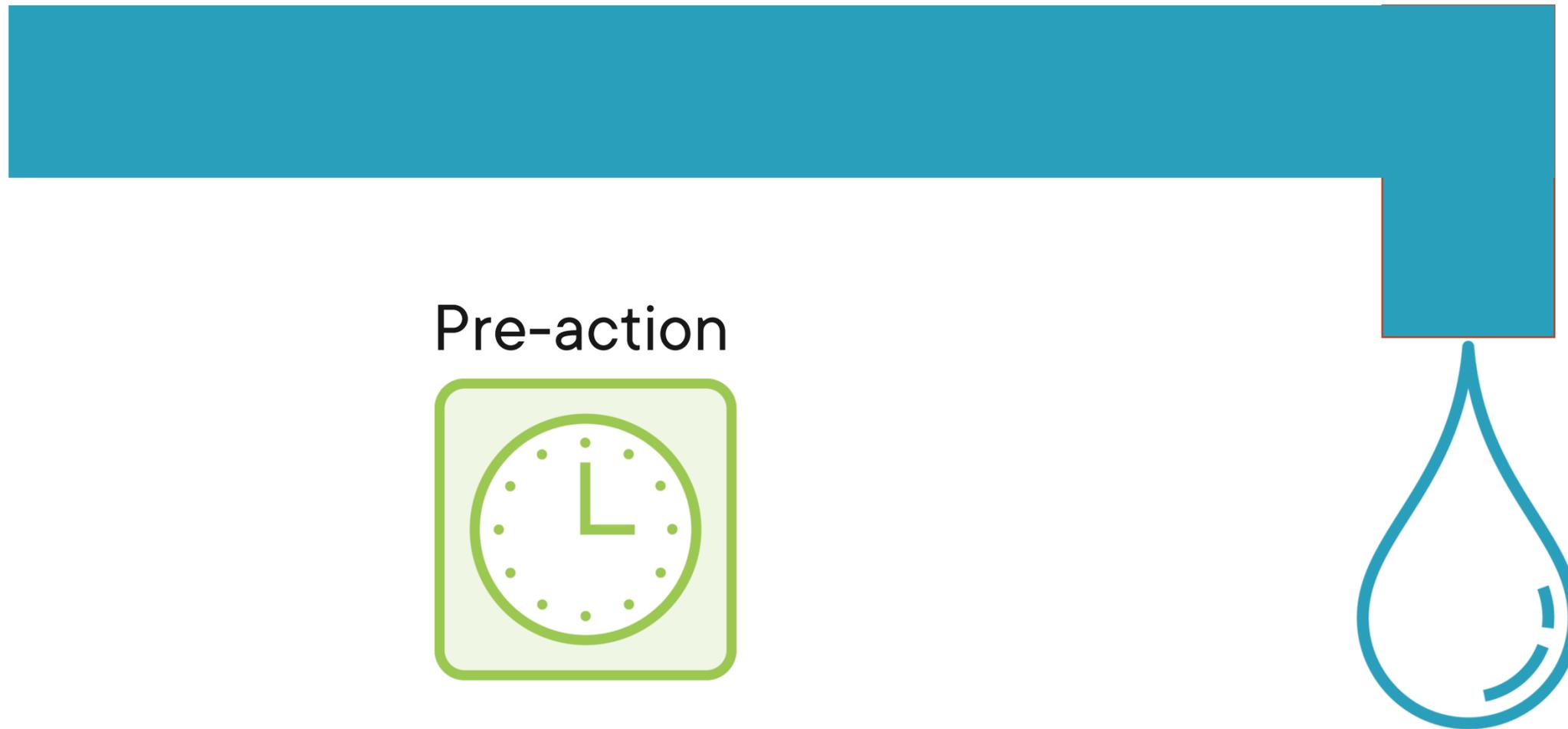


Pre-action



# Water-based Suppression in Data Centers

Dry-pipe



Pre-action



Emergency Power Off

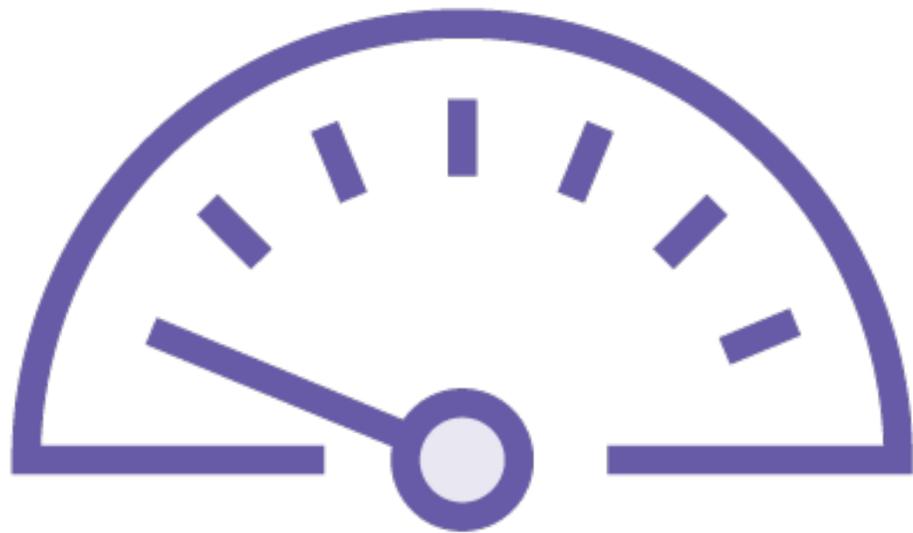


# Design Resilience - Heating Ventilation and Air Conditioning

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# Heating, Ventilation, and Air Conditioning (HVAC)



**Data centers have high electricity consumption**

**Have heavy carbon footprint**

**Most of the cost is cooling**

**Leaders in industry run systems at higher temperature**



**ASHRAE guides**

**18–27° C**

**5–15° C DP**

**60% RH**

Standards/Recommendations



# Types of Cooling

**Latent cooling**

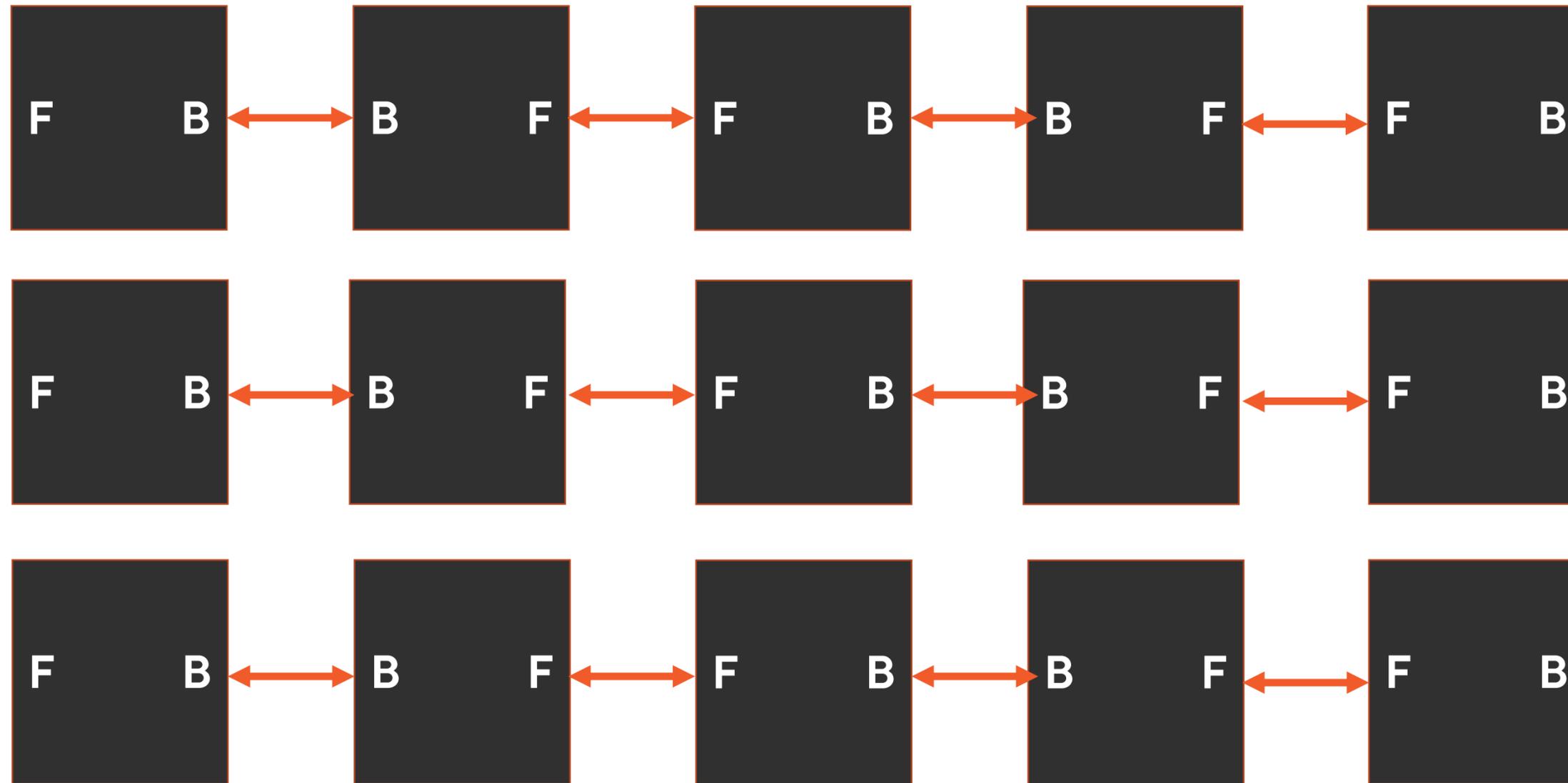
**Removes moisture**

**Sensible cooling**

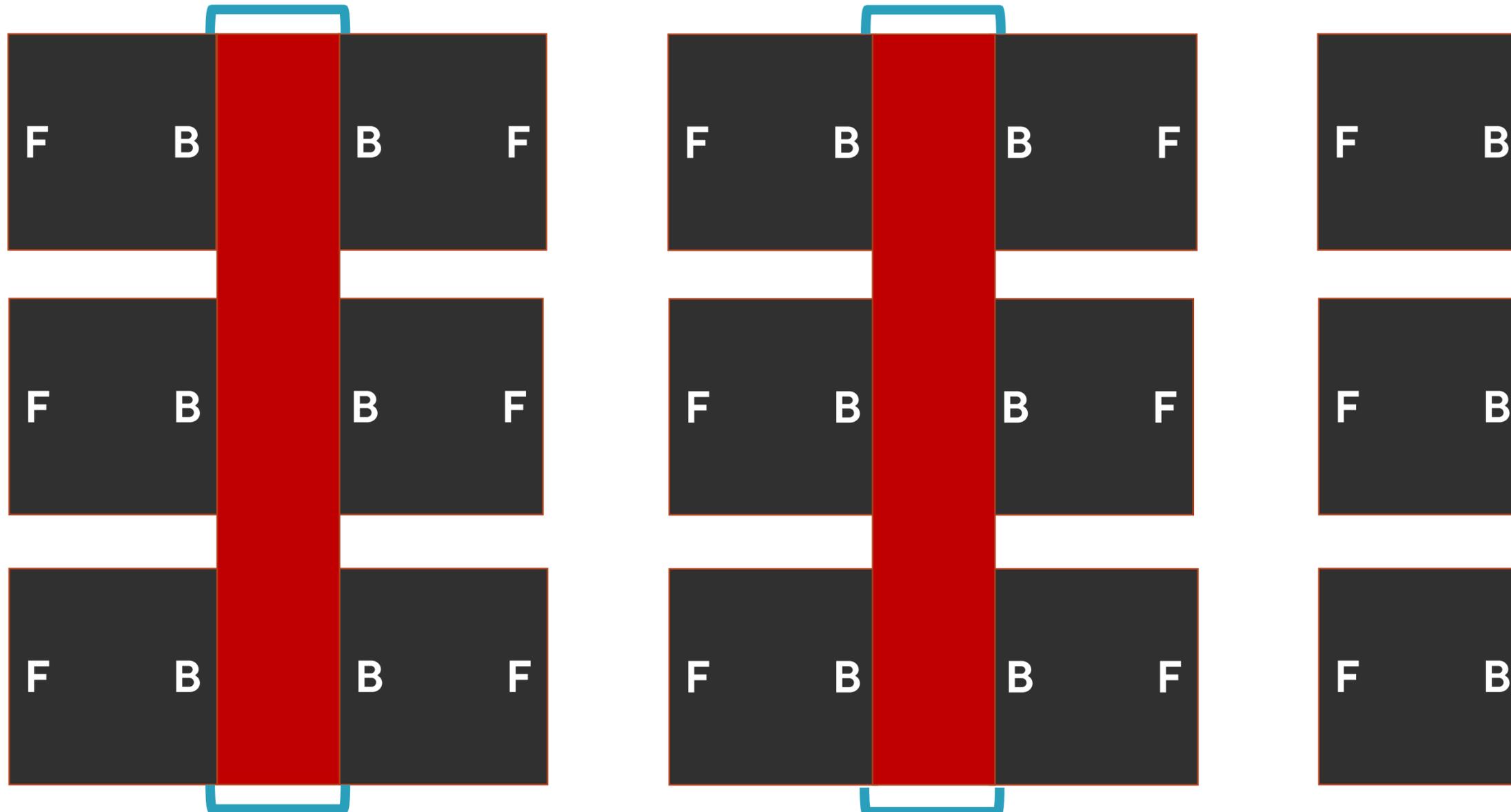
**Removes heat**



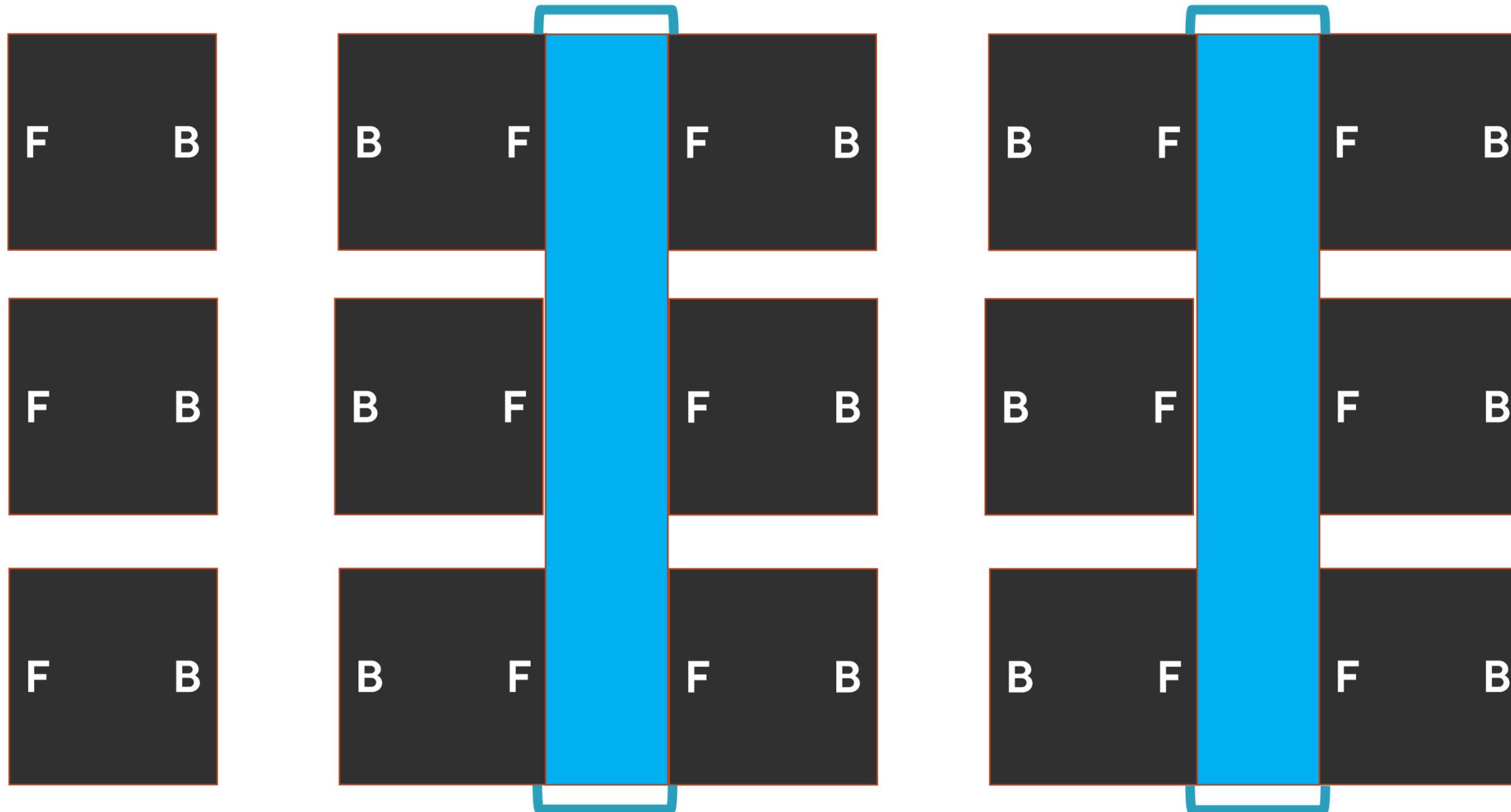
# Hot and Cold Aisle Containment



# Hot Aisle Containment



# Cold Aisle Containment



# Design Resilience – Availability Classes

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# Availability Classes

## Class 1

Single-path  
(no resilience)

## Class 2

Single-path  
(resilience)

## Class 3

Multipath  
(redundancy)

## Class 4

Multipath  
(fault tolerant)



# Data Center Site Infrastructure Tier Standard

Tier IV

Tier III

Tier II

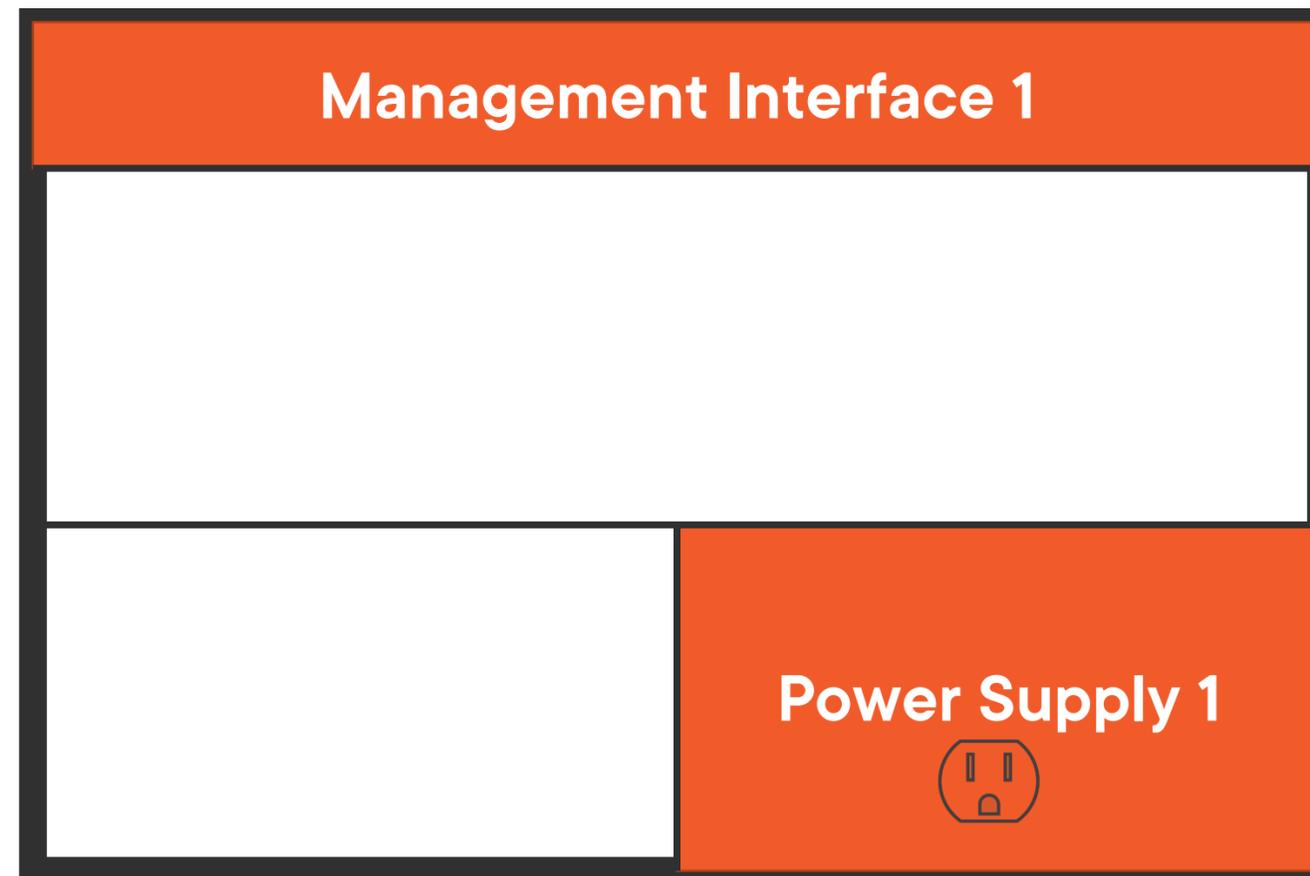
Tier I



# Data Center Site Infrastructure Tier Standard

**Tier I**

Data Switch 1



# Data Center Site Infrastructure Tier Standard

**Tier II**

Data Switch1

Management Interface 1

Management Interface 2

Power Supply 1



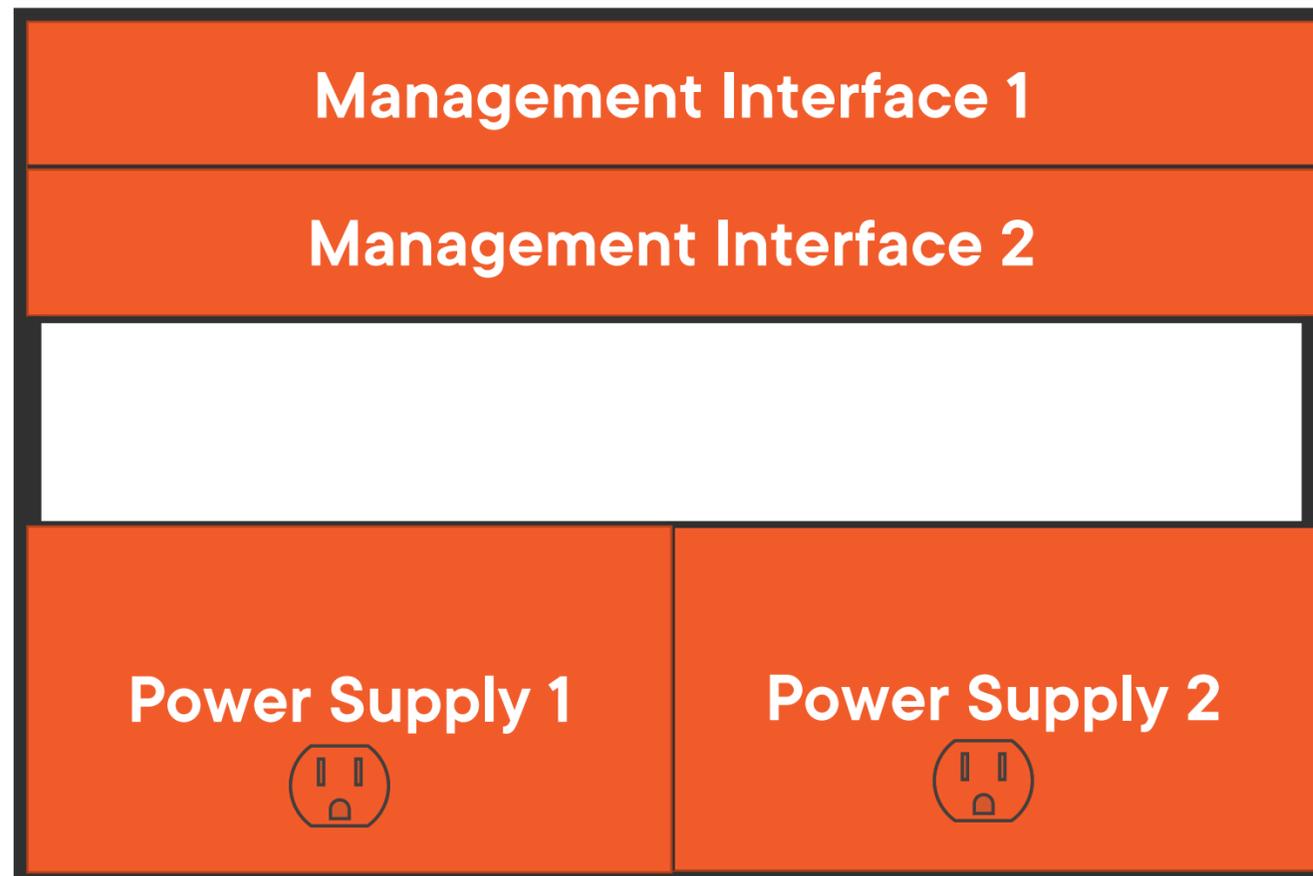
Power Supply 2



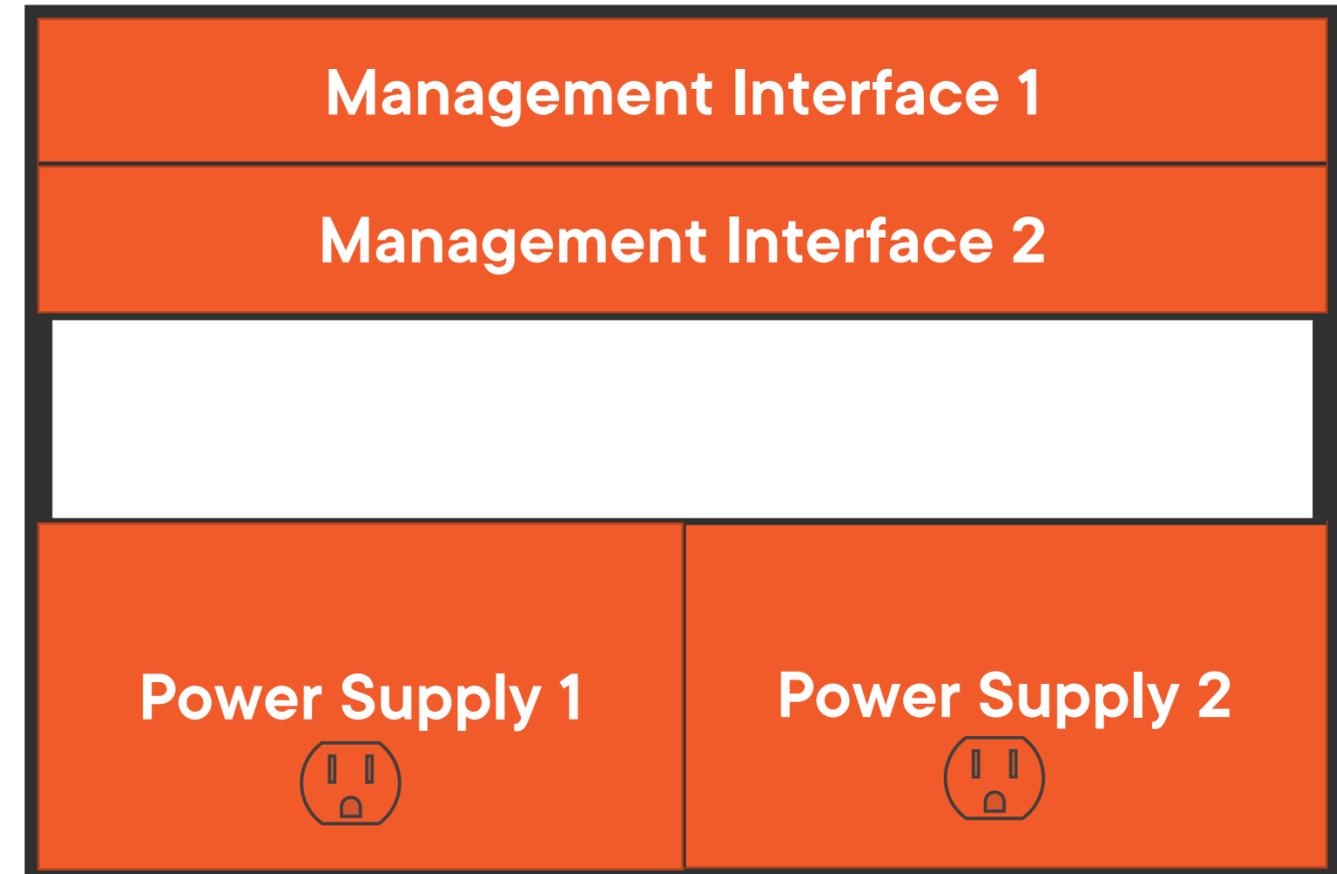
# Data Center Site Infrastructure Tier Standard

## Tier III

Data Switch 1 - Active



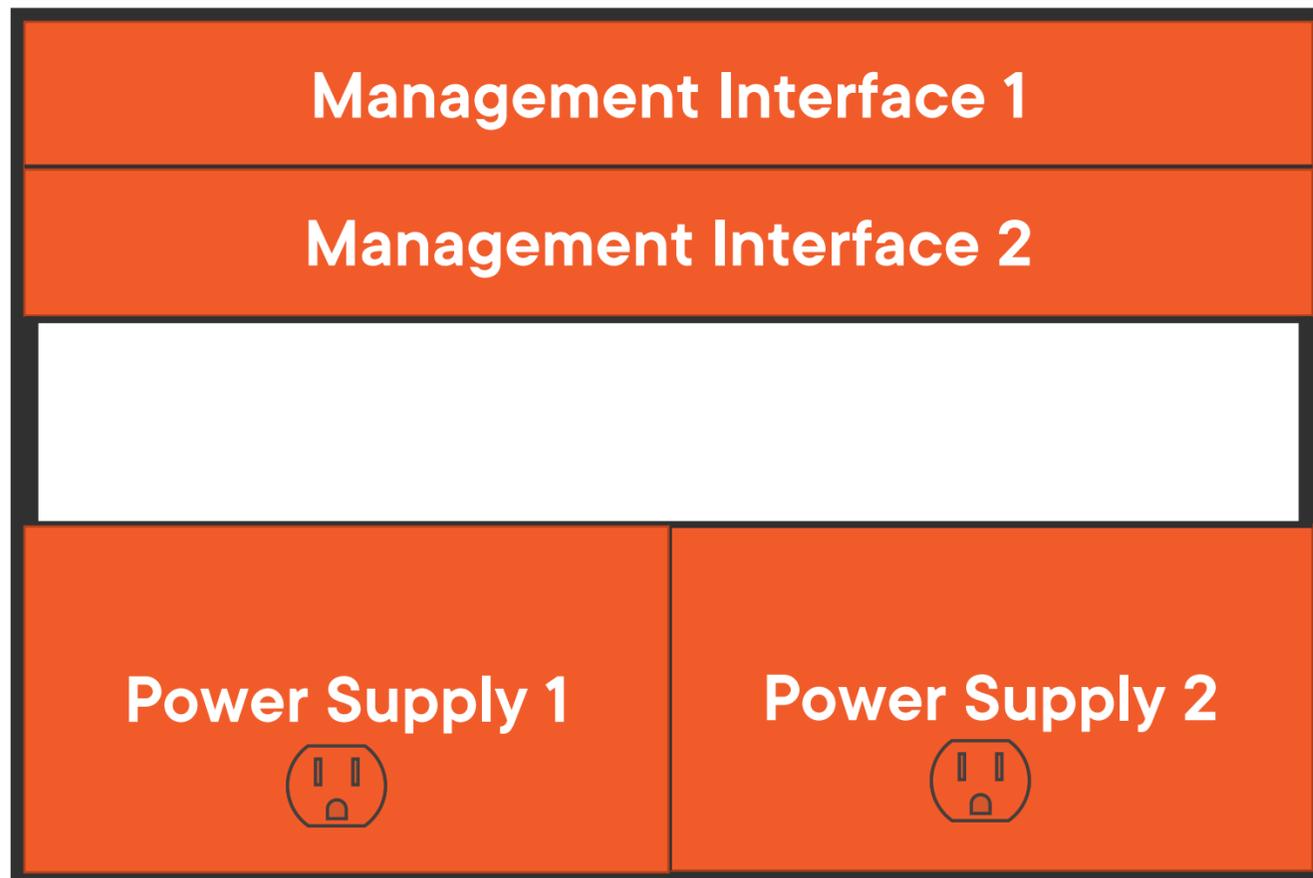
Data Switch 2 - Passive



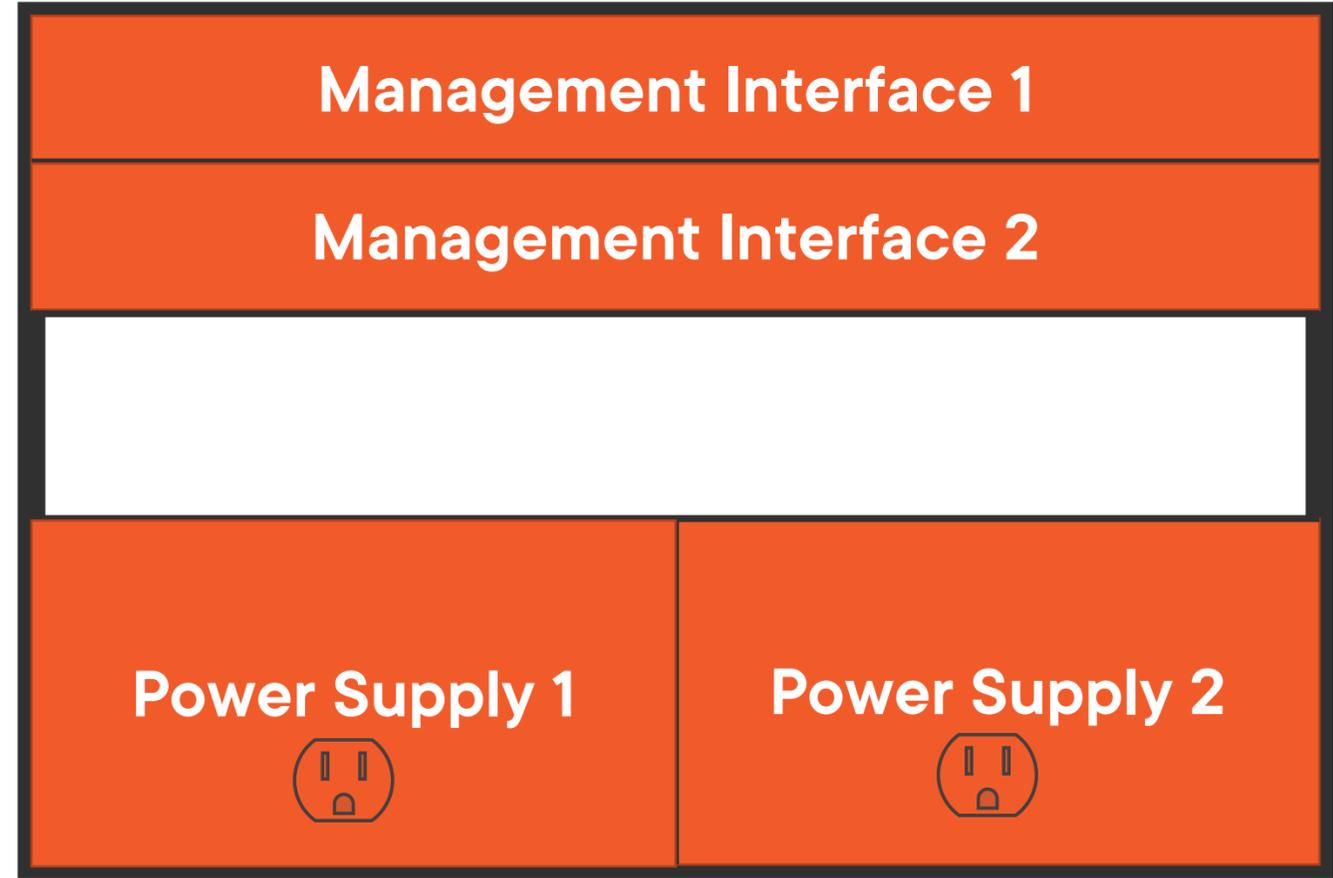
# Data Center Site Infrastructure Tier Standard

## Tier IV

Data Switch 1 - Active



Data Switch 2 - Active



## Summary



**How may the provider's renewable energy initiatives affect your patronage?**

**Consider how the modification of the threat environment affects availability**

**Understand how notions of protection classes can be used in your environment**



Up Next:  
Cloud-based BCDR

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