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Q. Celebrity Travels Celebrity Travels is a full-service travel agency that must keep all its data online. It also provides travel- and vacationrelated services to several other agencies. It has recently acquired Castro Services, another longestablished travel agency. Celebrity Travels wants to provide independent travel agents with the ability to use Celebrity's reservation system remotely for a certain fee.

Requirements

Because of shrinking profit margins, Celebrity Travels has decided to reduce expenses. Most of its 400-person workforce operate out of their homes, anyway, and have no need to visit the data center. The only people who must physically work at the data center are the NOC, equipment installers, and maintenance and security personnel. Celebrity Travels has decided to relocate its data center from one place to other place, where space and local help are far less Expensive. The company has purchased a large plot of land for its data center. It engages a data-center design consultant from the beginning to plan all the details.Unknown future expansion plans require the need for a flexible and scalable design that must provide high availability and servicing without equipment downtime. The consultant must make final determination regarding all aspects of the design and construction of the data center including size, raised floor design, rack layouts, HVAC systems, UPS, generators, electrical and mechanical distribution, fire suppression and detection, and network and electrical cable design.

1. Size and Capacity Planning

Physical Dimensions:

Design a facts center with an initial capacity for one hundred fifty racks, making an allowance for 50% growth (up to 225 racks).
Space estimation: ~10,000–12,000 square feet for core operations, apart from common areas (e.G., storage, staging, or workplaces).

Rack Dimensions:

Standard 42U racks (or better) for flexibility. Width: 24 inches, Depth: 42–48 inches, appropriate for cutting-edge server systems.

2. Raised Floor Design

Purpose

Raised flooring presents underfloor area for cable routing and cold air distribution.

Specifications

Height: 18 to 36 inches to accommodate electricity and records cabling, HVAC ducts, and chilled water pipes.
Use antistatic raised floor tiles rated for a static load of one,500 lbs per tile.
Zones for excessive and low-density gadget distribution.

3. Rack Layout Design

Arrangement:

Use hot aisle/cold aisle configuration to separate cool intake and hot exhaust air for efficient cooling.

Cold aisles: Face the front of racks.
Hot aisles: Align rear rack exhausts.
Density Optimization
Support high-density racks (12-20 kW consistent with rack). Use adaptive cooling for better overall performance zones.

4. HVAC (Cooling Systems)

System Design:

Deploy Computer Room Air Conditioning (CRAC) gadgets for cooling together with raised flooring.
Implement Hot Aisle Containment Systems (HACS) to maximize cooling performance.
Energy Efficiency

Opt for chilled water cooling with economizer modes (leveraging out of doors cool air).
Build for a Power Usage Effectiveness (PUE) target of 1.Four or underneath.
Five. Uninterruptible Power Supply (UPS)

Configuration
Modular UPS units helping N 1 redundancy with an preliminary potential of 1 MW, scalable to at least one.Five MW.

Battery Technology

Lithium-Ion (Li-Ion) batteries for prolonged lifecycle, compact size, and minimum upkeep.

6. Backup Generators

Specifications:

Diesel generators with as a minimum 72 hours of runtime.
N 1 redundancy at a strength ability of one.Five MW.
Placement
Positioned in a secure, ventilated area outside the data center. Include regular fuel transport contracts.

7. Electrical and Mechanical Distribution

Power Distribution Units (PDUs):

Install clever PDUs to screen rack electricity usage in real time.
Isolate redundant strength feeds to prevent cascading failures.
Circuit Protection
Use advanced circuit breakers and Automatic Transfer Switches (ATS) for fault isolation and seamless energy switch.

8. Fire Suppression and Detection

Fire Suppression Systems:

Inert gas machine (e.G., FM-two hundred or NOVEC 1230) for non-destructive, room-wide fireplace suppression.
Backup water mist fireplace suppression as a secondary gadget.
Detection
Deploy very early smoke detection apparatus (VESDA) for detecting capability hazards earlier than ignition.

9. Network Cable Design

Cable Management:

Install structured cabling with color-coded categories (power, statistics, fiber optics).
Fiber optic uplinks among racks for high-pace interconnections.

Redundancy

Two unbiased community paths to each rack.
Redundant backbone connections (e.G., darkish fiber or twin ISPs) for WAN hyperlinks.

10. Monitoring and Automation

DCIM Software:

Deploy Data Center Infrastructure Management (DCIM) gear to screen:

Power consumption
Cooling performance
Temperature and humidity

Automation
Automate power/cooling adjustments the usage of IoT sensors and AI-driven predictions.

11. Physical Security

Access Controls:

Biometric authentication (fingerprint or iris scanning).
Video surveillance with retention policies.
Zone-Based Security

Perimeter safety and managed room get admission to primarily based on characteristic (e.G., NOC, equipment installation regions).
Prototype Diagram (Description)
Racks (Hot/Cold Aisles) placed centrally.
HVAC/CRAC Units located strategically alongside the fringe.
Electrical and Network Distribution Zones strolling below raised floors.
Generous Spacing for expansions and simplicity of system installation.
UPS and Generators located in adjacent steady compartments or buildings.