Wisdom in Datacenter Tiering

ATD™
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214 UPTIME INSTITUTE

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Datacenter – Introduction

- Single most critical infrastructure
- Comprises
  - Non-IT Infra : Building, Electrical, Cooling, Safety
  - IT Infra – Servers, Storage, Networking, Applications
- Availability is a key Criteria
- Tiering = Availability
- CIO/IT Managers mainly focus on IT infrastructure.
- Critical factors in power and cooling are often overlooked

Datacenter Tiers

- Originally proposed by Uptime Institute, USA
- Later adopted by TIA and other standards bodies
- Four tier levels (Tier I to Tier IV)
- Each tier level indicate a certain level of uptime
- Tiering Specifications does not specify any technology
- Covers
  - Power
  - Cooling
  - Auxiliary Systems

Tier - I

- Basic Site Infrastructure
- Non-Redundant capacity components
- Non-Redundant distribution
- Example – Basic Server Rooms, Branch office server rooms
- Failures in capacity components or distribution will result in downtime
- Susceptible to human errors

Tier - II

- Redundant capacity components
- Non-Redundant distribution
- Failures in distribution will result in downtime
- Maintenance of capacity components or distribution might result in downtime
- Susceptible to human errors

Tier - III

- Fulfills all Tier I & Tier II requirements
- Redundant capacity components
  - Atleast N+1 redundancy
- Multiple independent distribution paths serving the IT equipments
  - One active and one standby
  - Telecom connectivity also requires redundant distribution
- All IT equipments must be dual-powered and fully compatible with the topology of a site's architecture
  - Use static switch for single corded equipment
- Concurrently maintainable
- Human Error might result in Failures

Tier - IV

- Fulfils all Tier I to Tier III requirements
- Multiple Active Paths
- N+N Redundancy and fault tolerance
- All cooling equipment is independently dual-powered, including chillers and Heating, Ventilating and Air Conditioning (HVAC) systems
- Fault tolerant site infrastructure with Capacity and distribution
- Compartmentalisation
- Continuous cooling
- Single Human Error will not affect the DC
- Uptime – 99.995%

Datacenter Components

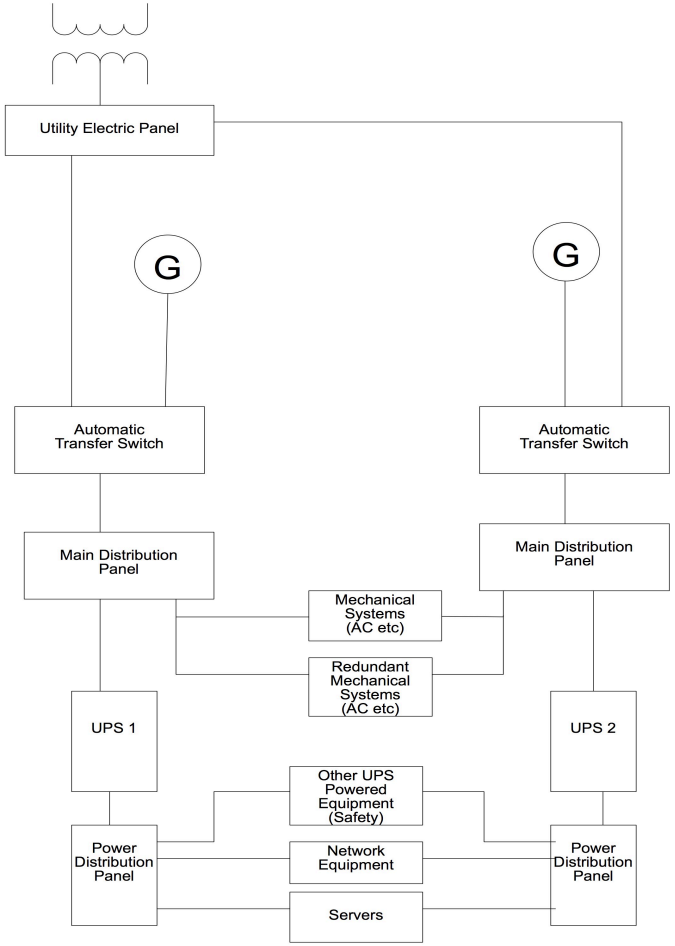
- Critical Infrastructure affecting tiering level
  - Electrical
  - Cooling (HVAC) System
- Auxiliary Systems that may be considered
  - Safety and Security Systems
  - Monitoring and Control
- Building, Interiors, etc (Civil)

Electrical

- Redundant Power Sources
  - Utility, DG
- Redundant Power Distribution
  - Redundant Paths
  - Redundant panels and switch gears
  - Concurrent maintainability
  - Bus bar Trunking System
- UPS
  - N+N Redundancy
- Power Protection
  - Surge Protection
  - Grounding
  - Harmonics
- Energy Efficiency

Typical Power distribution

Simple Power Distribution Arrangement for a Tier III Datacenter



For each and every component:

- **Redundant capacity (At least N+1)**
- **Concurrent Maintainability**

Cooling Systems

- Precision AC System
  - Properly engineered cooling system
  - Type: Air cooled, Chilled Water, etc
  - Cold Aisle/Hot Aisle
  - Hotspots
  - CFD Analysis
- Redundancy in Cooling system
  - N+1
- High Density Cooling

Auxiliary Systems

- **Non-critical for Tier Design. However it should not affect tiering objectives in power and cooling**
- **Safety and Security**
  - Physical Security
    - Fire and Tamper proof walls, Doors, etc
    - Multilevel Access Control
  - Fire Detection – Conventional/VESDA
  - Fire Suppression – FM200
  - Water Leakage/Rodent Repellant
  - CCTV
- **Monitoring**
  - BMS
  - Remote monitoring
  - Alerts

Tier Design Guidelines

- Power and Cooling are critical infrastructure
- Uptime Institute requires min-12hrs fuel storage for single capacity
- All equipments should be designed for the maximum IT load
- Should include all components like panels, piping, valves, etc
- Should be designed for continuous rating
    - ASHRAE Guidelines
    - Standby rating Vs Primary Rating
- Common mistakes – PRC configuration, Bus Couplers, Earthing, etc
- Pay Attention to Details

Common Myth

- “We need power from two utility companies for Tier IV design”
- The fact is that Uptime Institute does not consider Utility power as a reliable source.
- We can achieve Tier IV with redundant internal power generation using DG Sets

Uptime Institute Tier Certification

- Design Certification
- Site Certification
- Benefits
  - Gives assurance to the stake holders on the Datacenter availability
  - Risk Mitigation
  - Robust Datacenter design

Thanks

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