Gestión de Centro de Cómputos

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AGENDA

- **Flashback (Partes y componentes de un DC)**
- **Organismos Industriales Relevantes**
- **Normas y Referencias de Documentos Actuales**
- **Estandares para DC**
- **Principales Diferencias de los Estandares**
- **Clasificación Tier para DC**

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FLASHBACK (PARTES Y COMPONENTES DE UN DC)

Video 1: DC1 and DC2 of www.online.net

This video presents DC1 and DC2 datacenters, as well as Dedibox® infrastructure. Discover our hosting infrastructure built in 2011. Both datacenters are designed with an N+1 architecture: each active element has a redundant component.

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ORGANISMOS INDUSTRIALES RELEVANTES

- **The Uptime Institute**

  Fundado en 1993

- **ASHRAE**

  American Society of Heating, Refrigerating, and Air-Conditioning Engineers, fundada en 1894

- **The Green Grid**

  Fundado en 2007

- **AFCOM**

  Association for Computer Operations Management, fundada en 1980

ORGANISMOS INDUSTRIALES RELEVANTES

- **TIA**

  Telecommunications Industry Association, fundada en 1988
- **BICSI**

  Building Industry Consulting Service International, fundada en 1974
- **BCS**

  British Computer Society, fundado en 1957
- **DOE**

  US Department of Energy
- **EPA**

  US Environmental Protection Agency

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NORMAS Y REFERENCIAS DE DOCUMENTOS ACTUALES

- **Uptime Institute Tier Ratings for Data Center**
- **ASHRAE TC9.9 Guidelines for Mission Critical Facilities**
- **ANSI/TIA 942 Infraestructure Standar for Data Center**
- **ANSI/BICSI 002 Datacenter Design and Implementation Best Practice**
- **EU Code of Conduct for Data Center**

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WHY STANDARDS FOR DC?

- **Because of trends like cloud computing and virtualization and the increasing tendency of companies to outsource data center operations, requirements in terms of space are growing more complex.**
- **Functions must be defined and assigned to separate rooms. This leads to room structures that must be specially designed.**

WHY STANDARDS FOR DC?

A typical data center is divided into:

- **An access area,**
- **Computer room and**
- **Work area for administrators**
- **UPS batteries, emergency power generators and the cooling system are each located in separate rooms.**

Areas in the premises must also be made available for access control, video monitoring and alarm systems. And last but not least, sufficient space must be maintained for data cabling. Every area affects other areas.

WHY STANDARDS FOR DC?

When planning how to divide up space, key goals are always to provide for smooth administration of the data center, to:

- **Facilitate quick recoveries in the event of system faults**
- **To make it possible for the data center to be expanded**
- **Migrated as necessary and all this without great administration overhead.**

OVERVIEW OF RELEVANT STANDARDS

The three most important organizations in this area are:

- ISO/IEC (International Organization for Standardization / International Electrotechnical Commission), responsible for developing international standards
- CENELEC (European Committee for Electrotechnical Standardization), responsible for developing European standards
- ANSI (American National Standards Institute), responsible for developing American standards.

OVERVIEW OF RELEVANT STANDARDS

The following bodies of standards relate to data center cabling:

- ISO/IEC 24764
- EN 50173-5
- EN 50600-2-4
- TIA-942-A

Though these four standards focus on different areas, they all center on the structure and performance of cabling systems. Their goal is to provide a flexible, scalable and clearly laid out structure for cabling systems. This will allow for rapid isolation of faults as well as system changes and expansions.

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DELIMITING DIFFERENT STANDARDS

Criteria	ISO/IEC 24764	EN 50173-5	TIA-942-A
Structure	✓	✓	✓
Cabling performance	✓	✓	✓
Redundancy	✓	✓	✓
Grounding/equipotential bonding	IEC 60364-1	EN 50310	TIA-607-B
Tier classification	✗	✗	✓
Cable routing	IEC 14763-2 [1]	EN 50174-2 /A1	✓ [2]
Ceilings and double floors	IEC 14763-2 [1]	EN 50174-2 /A1	✓ [6]
Floor load	✗	✗	✓
Space requirements (ceiling height, door width)	IEC 14763-2 [1]	EN 50174-2 /A1 [3]	✓
Power supply / UPS	✗	✗	✓
Fire protection/safety		EN 50174-2 /A1 [4]	✓ [4]
Cooling	✗	✗	✓
Lighting	✗	✗	✓
Administration/labeling	IEC 14763-1 [5]	EN 50174-2 /A1 [5]	TIA-606-B
Temperature / humidity	✗	✗	✓

[1] not data center-specific, [2] cable separation is covered in TIA-569-C, [3] door widths and ceiling height only, [4] refers to local standards, [5] refers to complexity level, [6] refers to TIA-569

Fuente:Data Center Handbook V5.0, R&M, pág.

DC STANDARDS SUMMARY

- **ANSI/TIA-942 is a comprehensive document that provides data center planners with guidelines for design, construction and expansion within telecom, electrical, architectural, mechanical and security areas.**
- **ANSI/TIA-942 provides mandatory infrastructure standards and informational guidelines presented by levels of performance and availability known as "tiers."**
- **ANSI/TIA-942 is an excellent vehicle for communication among data center professionals and provides tremendous value by addressing many previously disparate topics in one document.**

DC STANDARDS SUMMARY

The ANSI/TIA-942 is a standard that gives guidelines for the design and installation of a data center. The standard specifies:

- **Cabling design**
- **Network design**
- **Facilities design**
- **Informative annexes containing “best practices” and availability requirements**
- **Spaces**
- **Pathways**
- **Racks/cabinets**

DC STANDARDS SUMMARY

Other standards to reference for products in your data center include the following:

- **IEEE 802.3AN (10GBASE-T TASK FORCE)**
- **ANSI/TIA-568B.2 (AD10) – AUGMENTED CATEGORY 6 TRANSMISSION PERFORMANCE AND ISO 11801 CLASS EA**
- **IEEE 802.3AF AND 802.3AT POWER OVER ETHERNET STANDARDS**
- **ANSI/TIA-569-B COMMERCIAL BUILDING STANDARD FOR TELECOMMUNICATIONS PATHWAYS AND SPACES**
- **ANSI/TIA-606-A ADMINISTRATION STANDARD FOR THE TELECOMMUNICATIONS INFRASTRUCTURE OF COMMERCIAL BUILDINGS**
- **ANSI-J-STD-607-A-2002 COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS**

DC STANDARDS SUMMARY

Since no standard is complete in itself, all relevant standards should be consulted as the planning process begins. The most demanding and most advanced standard should then be used, in light of the given requirements and the technical area under development. Example: In the case of cabling performance, the standard with the highest performance requirements for cabling components should be used as a basis for planning. The same applies for other parameters.

Recommendation:

The relevant standard should be listed in specifications in the technical to ensure defined! order requirements are clearly

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WHAT IS?

The Uptime Institute *Tier Standard: Topology* is an objective basis for comparing the functionality, capacity, and expected availability (or performance) of a particular site infrastructure design topology against other sites, or for comparing group of sites. This Standard describes a criteria differentiate four classifications of site infrastructure topology based on increasing levels of redundant capacity components and distribution paths. This Standard focuses on the definitions of the four Tiers and the performance confirmation tests for determining compliance to the definitions.

OUTLINE

- **Describe the site-level infrastructure required to sustain data center operations, not the characteristics of individual systems or subsystems.**
- **Data centers are dependent upon the successful and integrated operation of electrical, mechanical, and building systems.**
- **The Tier topology rating for an entire site is constrained by the rating of the weakest subsystem that will impact site operation.**
- **There are no partial or fractional Tier ratings.**

OUTLINE

- **Tier rating is not the average of the ratings for the critical site infrastructure subsystems.**
- **The Tier rating cannot be claimed by using calculated mean time between failures (MTBF).**
- **This Standard is independent of the IT systems operating within the site.**

SCOPE

- **This Standard establishes four distinctive definitions of data center site infrastructure Tier classifications (Tier I, Tier II, Tier III, Tier IV), and the performance confirmation tests for determining compliance to the definitions.**
- **Compliance with the requirements of each Tier is measured by outcome-based confirmation tests and operational impacts. This method of measurement differs from a prescriptive design approach or a checklist of required equipment.**

PURPOSE

The purpose of this Standard is to design professionals, data center operators, equipmon-technical managers with an objective and effective means for identifying the anticipated performance of different data center site infrastructure design topologies.

TIER I: BASIC SITE INFRASTRUCTURE

- **The fundamental requirement:**

  a. A Tier I basic data center has non-redundant capacity components and a single, non-redundant distribution path serving the critical environment. Tier I infrastructure includes: a dedicated space for IT Systems; a UPS to filter power spikes, sags, and momentary outages; dedicated cooling equipment; and an engine generator to protect IT functions from extended power outages.

  b. Twelve hours of on-site fuel storage for engine generator(s).

TIER I: BASIC SITE INFRASTRUCTURE

- **The performance confirmation tests:**

  a. There is sufficient capacity to meet the needs of the site.
  b. Planned work will require most or all of the site infrastructure systems to be shut down affecting critical environment, systems, and end users.

TIER I: BASIC SITE INFRASTRUCTURE

- **The operational impacts:**

  a. The site is susceptible to disruption from both planned and unplanned activities. Operation (Human) errors of site infrastructure components will cause a data center disruption.

  b. An unplanned outage or failure of any capacity system, capacity component, or distribution element will impact the critical environment.

  c. The site infrastructure must be completely shut down on an annual basis to safely perform necessary preventive maintenance and repair work. Urgent situations may require more frequent shutdowns. Failure to regularly perform maintenance significantly increases the risk of unplanned disruption as well as the severity of the consequential failure.

TIER II: REDUNDANT SITE INFRASTRUCTURE CAPACITY COMPONENTS

- **The fundamental requirement:**

  a. A Tier II data center has redundant capacity components and a single, non-redundant distribution path serving the critical environment. The redundant components are extra engine generators, UPS modules and energy storage, chillers, heat rejection equipment, pumps, cooling units, and fuel tanks.

  b. Twelve hours of on-site fuel storage for ‘N’ capacity.

TIER II: REDUNDANT SITE INFRASTRUCTURE CAPACITY COMPONENTS

- **The performance confirmation tests:**

  a. Redundant capacity components can be removed from service on a planned basis without causing any of the critical environment to be shut down.

  b. Removing distribution paths from service for maintenance or other activity requires shutdown of critical environment.

  c. There is sufficient permanently installed capacity to meet the needs of the site when redundant components are removed from service for any reason.

TIER II: REDUNDANT SITE INFRASTRUCTURE CAPACITY COMPONENTS

- **The operational impacts:**

  a. The site is susceptible to disruption from both planned activities and unplanned events. Operation (Human) errors of site infrastructure components may cause a data center disruption.

  b. An unplanned capacity component failure may impact the critical environment. An unplanned outage or failure of any capacity system or distribution element will impact the critical environment.

  c. The site infrastructure must be completely shut down on an annual basis to safely perform preventive maintenance and repair work. Urgent situations may require more frequent shutdowns. Failure to regularly perform maintenance significantly increases the risk of unplanned disruption as well as the severity of the consequential failure.

TIER III: CONCURRENTLY MAINTAINABLE SITE INFRASTRUCTURE

- **The fundamental requirements:**
  a. A Concurrently Maintainable data center has redundant capacity components and multiple independent distribution paths serving the critical environment. Only one distribution path is required to serve the critical environment at any time.
  b. All IT equipment is dual powered as defined by Uptime Institute's Fault Tolerant Power Compliance Specification, Version 2.0 and installed properly to be compatible with the topology of the site's architecture. Transfer devices, such as point-of-use switches, must be incorporated for critical environment that does not meet this specification.
  c. Twelve hours of on-site fuel storage for 'N' capacity.

TIER III: CONCURRENTLY MAINTAINABLE SITE INFRASTRUCTURE

- **The performance confirmation tests:**
  a. Each and every capacity component and element in the distribution paths can be removed from service on a planned basis without impacting any of the critical environment.
  b. There is sufficient permanently installed capacity to meet the needs of the site when redundant components are removed from service for any reason.

TIER III: CONCURRENTLY MAINTAINABLE SITE INFRASTRUCTURE

- **The operational impacts:**
  a. The site is susceptible to disruption from unplanned activities. Operation errors of site infrastructure components may cause a computer disruption.
  b. An unplanned outage or failure of any capacity system will impact the critical environment.
  c. An unplanned outage or failure of a capacity component or distribution element may impact the critical environment.
  d. Planned site infrastructure maintenance can be performed by using the redundant capacity components and distribution paths to safely work on the remaining equipment.
  e. During maintenance activities, the risk of disruption may be elevated. (This maintenance condition does not defeat the Tier rating achieved in normal operations.)

TIER IV: FAULT TOLERANT SITE INFRASTRUCTURE

- **The fundamental requirements:**
  a. A Fault Tolerant data center has multiple, independent, physically isolated systems that provide redundant capacity components and multiple, independent, diverse, active distribution paths simultaneously serving the critical environment. The redundant capacity components and diverse distribution paths shall be configured such that capacity is providing power and cooling to the critical environment after any infrastructure failure.
  b. All IT equipment is dual powered as defined by Uptime Institute's *Fault Tolerant Power Compliance Specification, Version 2.0* and installed properly to be compatible with the topology of the site's architecture. Transfer devices, such as point-of-use switches, must be incorporated for critical environment that does not meet this specification.

TIER IV: FAULT TOLERANT SITE INFRASTRUCTURE

- **The fundamental requirements:**
  c. Complementary systems and distribution paths must be physically isolated from one another (compartmentalized) to prevent any single event from simultaneously impacting both systems or distribution paths.
  d. Continuous Cooling is required.
  e. Twelve hours of on-site fuel storage for ‘N’ capacity.

TIER IV: FAULT TOLERANT SITE INFRASTRUCTURE

- **The performance confirmation tests:**
  a. A single failure of any capacity system, capacity component, or distribution element will not impact the critical environment.
  b. The infrastructure controls system demonstrates autonomous response to a failure while sustaining the critical environment.
  c. ***Each and every*** capacity component and element in the distribution paths can be removed from service on a planned basis without impacting any of the critical environment.
  d. There is sufficient capacity to meet the needs of the site when redundant components or distribution paths are removed from service for any reason.

TIER IV: FAULT TOLERANT SITE INFRASTRUCTURE

- **The operational impacts:**
  a. The site is not susceptible to disruption from a single unplanned event.
  b. The site is not susceptible to disruption from any planned work activities.
  c. The site infrastructure maintenance can be performed by using the redundant capacity components and distribution paths to safely work on the remaining equipment.

TIER IV: FAULT TOLERANT SITE INFRASTRUCTURE

- **The operational impacts:**

  d. During maintenance activity where redundant capacity components or a distribution path shut down, the critical environment is exposed to an increased risk of disruption in the event a failure occurs on the remaining path. This maintenance configuration does not defeat the Tier rating achieved in normal operations.

  e. Operation of the fire alarm, fire suppression, or the emergency power off (EPO) feature may cause a data center disruption.

TIER REQUIREMENTS SUMMARY

	Tier I	Tier II	Tier III	Tier IV
Active Capacity Components to Support the IT Load	N	N+1	N+1	N After any Failure
Distribution Paths	1	1	1 Active and 1 Alternate	2 Simultaneously Active
Concurrently Maintainable	No	No	Yes	Yes
Fault Tolerance	No	No	No	Yes
Compartmentalization	No	No	No	Yes
Continuous Cooling	No	No	No	Yes

Fuente: Data Center Site Infrastructure Tier Standard: Topology, Uptime Institute, pág 9.

ENGINE-GENERATOR SYSTEMS

- **Engine-generator systems are considered the primary power source for the data center. The local power utility is an economic alternative. Disruptions to the utility power are not considered a failure, but rather an expected operational condition for which the site must be prepared. Accordingly, engine generators must automatically start and assume load upon loss of utility.**
- **A Tier III or IV engine-generator system, along with its power paths and other supporting elements, shall meet the Concurrently Maintainable and/or Fault Tolerant performance confirmation tests while they are carrying the site on engine-generator power.**

NIVELES DE DISPONIBILIDAD

Niveles (%)	Tiempo de no disponibilidad
99	88 horas
99,9	8,8 horas
99,99	53 minutos
99,999	5,3 minutos
99,9999	32 segundos

En base a 8760 horas/año

Tier I -> 99,671%

Tier II -> 99,741%

Tier III -> 99,982%

Tier IV-> 99,995%

FUENTES Y LECTURAS ADICIONALES

- **Data Center Design Awareness [L1], DC Professional Development.**
- **Data Center Handbook V5.0, R&M.**
- **Data Center Site Infrastructure Tier Standard: Topology, Uptime Institute.**
- **Data Center Infrastructure Resource Guide, Anixter Inc.**