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01 infra TI

# Introdução: O que é um Data Center?



Universidade Presbiteriana Mackenzie

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Uma visão geral da complexidade de um centro de dados; Definição; Exemplos; Seus principais componentes; Outros componentes e recursos; Tiers de Data Centers; Uma visão geral do curso, referências e sua logística.

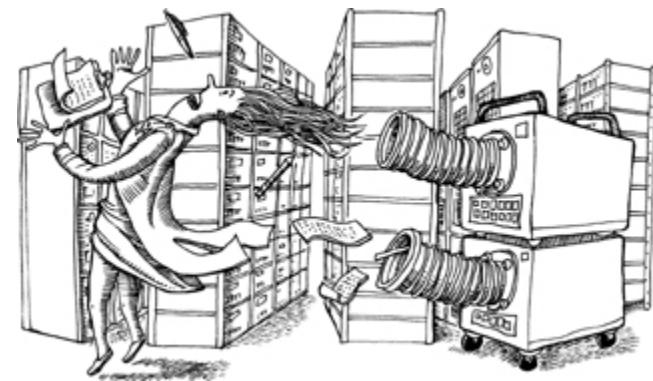
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# Data center

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Um centro de dados, ou *data center*, é uma instalação que contém o armazenamento de informações e outros recursos físicos de tecnologia da informação (TI) para a processar, comunicar e armazenar de informações.



# Data center: imagens

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Acesse: google.com “data center” > imagens  
Para ver imagens de alguns principais data centers



Acesse: <https://www.google.com/about/datacenters/inside/streetview>  
para fazer um passeio no data center do Google

# Data center: Quantos servidores?

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<http://www.datacenterknowledge.com/archives/2009/05/14/whos-got-the-most-web-servers/>

- Microsoft has more than 1 million servers, according to CEO Steve Ballmer (July, 2013)
- Facebook has “hundreds of thousands of servers” (Facebook’s N. Ahmad, June 2013)
- Akamai Technologies: 127,000 servers (company, July 2013)
- Intel: 75,000 servers (company, August, 2011)
- eBay: 54,011 servers (DSE dashboard, July 2013)

# Data center: Quantos servidores?

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<http://www.datacenterknowledge.com/archives/2009/05/14/whos-got-the-most-web-servers/>

**Google:** The company doesn't release numbers, but a recent report from energy expert Jonathan Koomey estimated that Google had 900,000 servers, based on an extrapolation from data Google provided on its total energy usage. Google's recently revealed container data center holds more than 45,000 servers, and that's a single facility built in 2005.

**Amazon:** It runs the world's largest online store and one of the world's largest cloud computing operations. Amazon says very little about its data center operations, but we know that it bought \$86 million in servers from Rackable in 2008, and stores 40 billion objects in its S3 storage service. A 2009 analysis by Randy Bias estimates that 40,000 servers are dedicated to running Amazon Web Services' EC2.

**HP/EDS:** While server "ownership" is less distinct with system integrators, EDS has an enormous data center operation. Company documents (PDF) say EDS is managing 380,000 servers in 180 data centers.

# Data center: Complexidade

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Nesse *tour* você pode perceber que um Data Center é uma estrutura complexa que envolve um grande volume de recursos, pessoas e tecnologias para prover serviços de processamento.

# Data center: 5 Componentes Chave

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**Application:** A computer program that provides the logic for computing operations

**Database management system (DBMS):** Provides a structured way to store data in logically organized tables that are interrelated

**Host or compute:** A computing platform (hardware, firmware, and software) that runs applications and databases

**Network:** A data path that facilitates communication among various networked devices

**Storage:** A device that stores data persistently for subsequent use.

These core elements are typically viewed and managed as separate entities, but all the elements must work together to address data-processing requirements.

# Data center: Outros Recursos

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**Embora os recursos anteriores sejam o principal foco desse curso, outros recursos ainda precisam ser considerados no desenvolvimento e manutenção de um Data Center**

**Facilities:** espaço, instalações físicas, dispositivos de refrigeração etc.

**Energia:** fontes de energia próprias

**Processos:** Operação, Segurança, Provisionamento etc.

**Pessoas:** ... no final os responsáveis por tudo isso

# Data center: main components

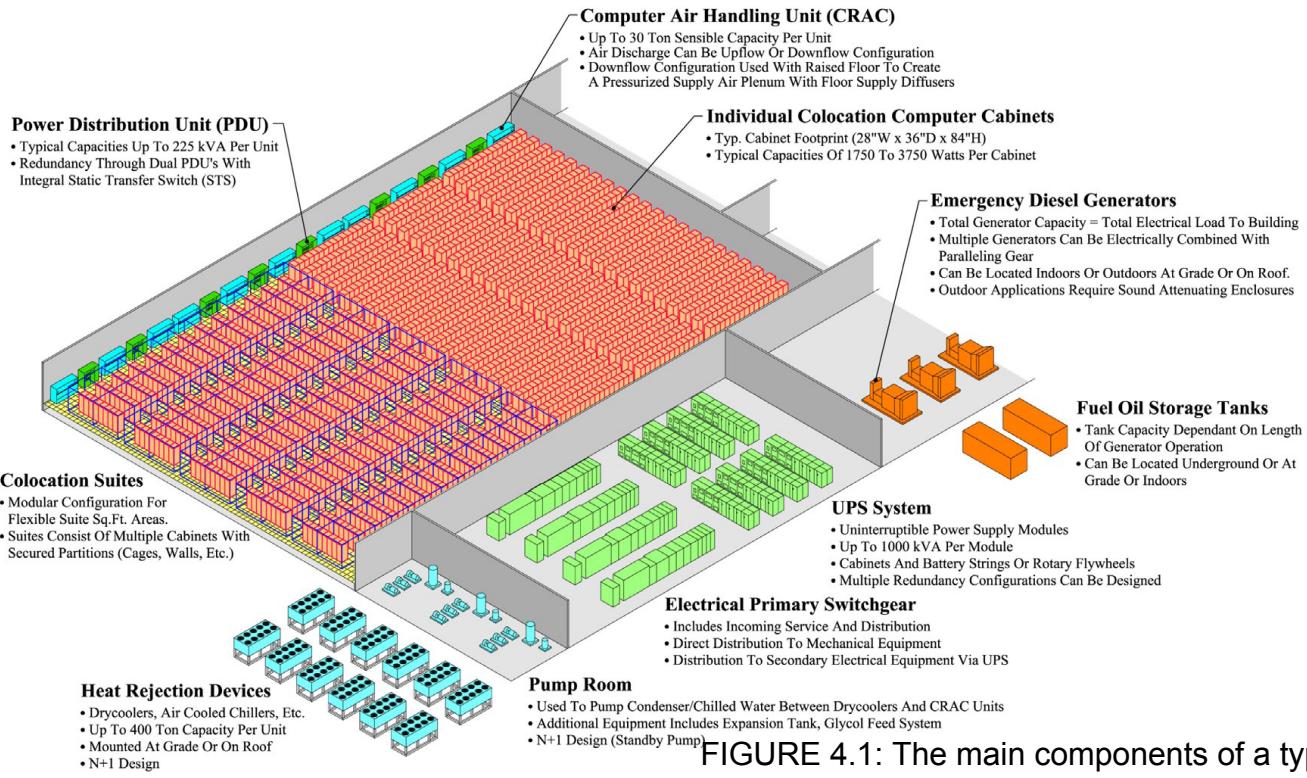


FIGURE 4.1: The main components of a typical datacenter

# Data center: typical components

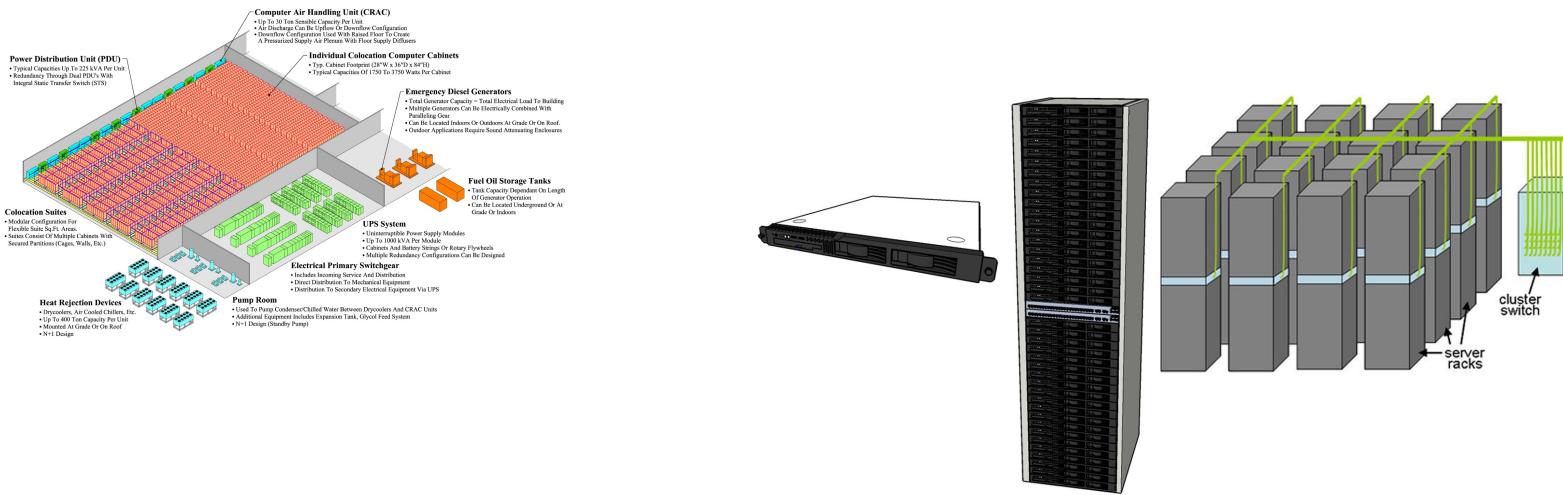


FIGURE 1.1: Typical elements in warehouse-scale systems: 1U server (left), 7' rack with Ethernet switch (middle), and diagram of a small cluster with a cluster-level Ethernet switch/router (right).

# Data center: typical components

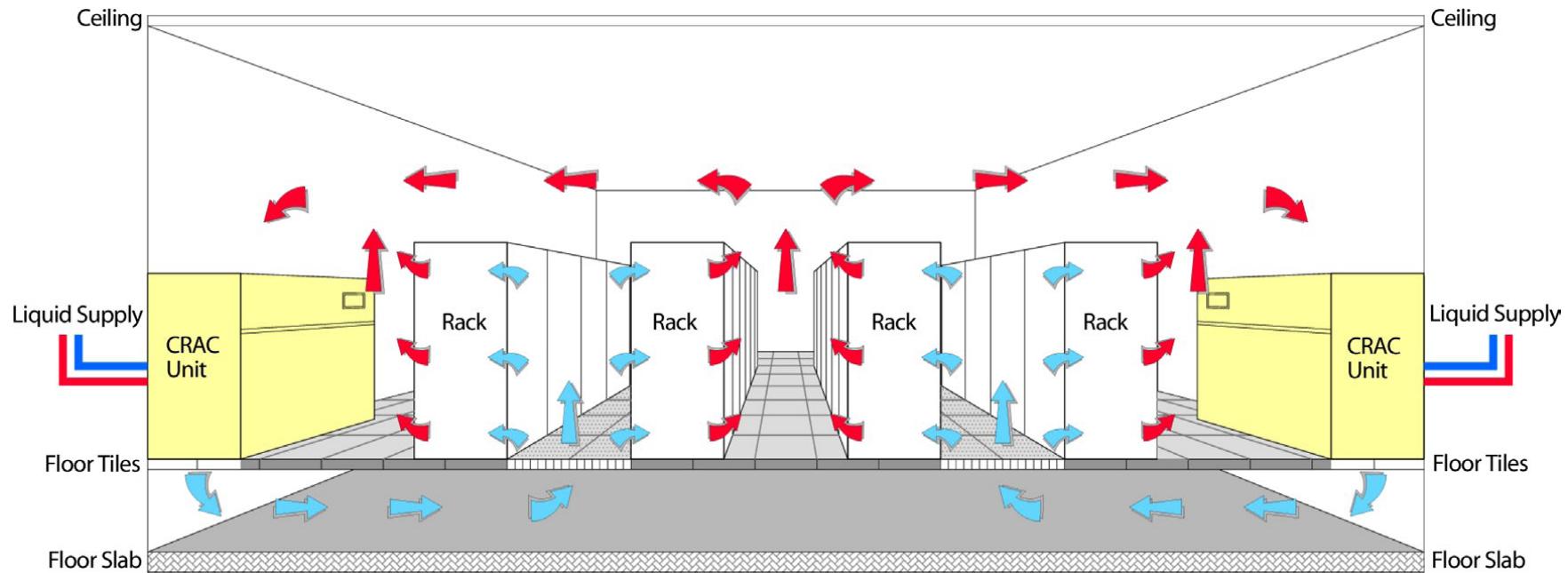


FIGURE 4.2: Datacenter raised floor with hot–cold aisle setup

# Data center: energy

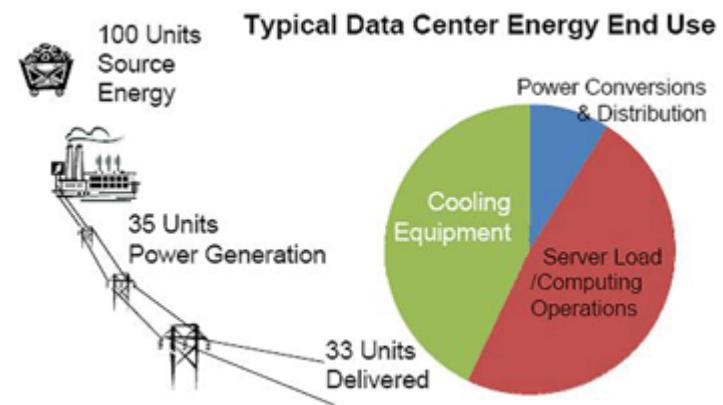
Currently, the typical 3-year cost (operating expenses + amortized capital expenses) of powering and cooling servers is approximately 1.5 times the cost of the server hardware itself, and the projections for 2012 go much higher. Energy efficiency measures are thus of high importance for data center designers, operators, and owners.

<http://www.datacenterknowledge.com/archives/2011/02/04/tackling-todays-data-center-energy-efficiency-challenges/>

Power tier	Watts/rack
Ultra-high density <sup>a</sup>	25 kW
Very high density (e.g. blade servers) <sup>b</sup>	20 kW
High density (e.g., 1U servers)	16 kW
Storage equipment	12 kW
Network switching equipment	8 kW
Normal density	6 kW

a. Projected top tier in 2015

b. Current top tier in 2010



# Data center: Tier Classifications

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**Tier I** datacenters have a single path for power and cooling distribution, without redundant components.

**Tier II** adds redundant components to this design ( $N + 1$ ), improving availability.

**Tier III** datacenters have multiple power and cooling distribution paths but only one active path. They also have redundant components and are concurrently maintainable, that is, they provide redundancy even during maintenance, usually with an  $N + 2$  setup.

**Tier IV** datacenters have two active power and cooling distribution paths, redundant components in each path, and are supposed to tolerate any single equipment failure without impacting the load.

Tier	Generators	UPSs	Power feeds	HVAC	Availability
1	None	N	Single	N	99.671%
2	N	N+1 <sup>a</sup>	Single	N+1	99.741%
3	N+1	N+1 <sup>a</sup>	Dual, switchable	N+1	99.982%
4	2N	2N	Dual, simultaneous	2N	99.995%

a. With redundant components

# Discussão e exercícios

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Por que centralizar os recursos computacionais em um centro de dados?  
Relacione isso com o fato de várias empresas terem centros de dados distribuídos geograficamente.

Relacione (os principais) tipos de aplicações fornecidas por um data center.

Se justifica um data center de um hospital (menos de 100 servidores) em tier IV enquanto encontramos um data center de hosting (mais de 1000 servidores) com tier II ou III ?

# Leitura recomendada

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**The Datacenter as a Computer: An Introduction to the Design of Warehouse-Scale Machines**

Luiz André Barroso and Urs Hözle 2009

# Visão Geral do Curso

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## Programa geral

### Sistemas de Armazenamento

**~ 5 semanas**

Tipos de dados, Conexões SCSI e FC, Redes de Armazenamento SAN, NAS e CAS

### Continuidade de Negócios

**~ 2 semanas**

Tipos de falha, Backup, Replicação de dados, Tempo de recuperação de falha

### Computação em Nuvem

**~ 3 semanas**

Virtualização, Computação em Nuvem, modelos de serviço em Nuvem

### Aspectos físicos de um Data Center

**~ 1 semana**

Energia e refrigeração, eficiência energética, *Green Data Centers*

# Visão Geral do Curso

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## Referências

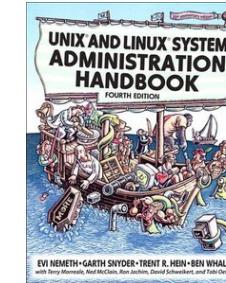
**Information Storage and Management Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments**

2nd Edition Edited by Somasundaram Gnanasundaram, Alok Shrivastava



**UNIX and Linux system administration handbook**

Evi Nemeth ... [et al.]. —4th ed. ISBN 978-0-13-148005-6



+Leituras recomendadas ao longo do curso

# Visão Geral do Curso

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## Logística

2 Avaliações Intermediárias

1 Avaliação Final

Atividades

Média intermediária MI = ( 1 P1 + 2 P2 + 1 Atividades ) / 5

Média final MF = ( MI + PF ) / 2