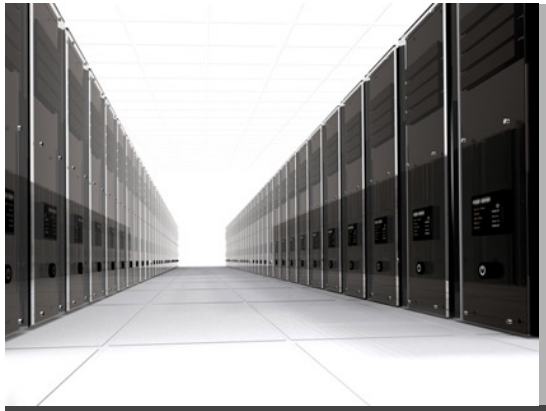

DC INFRASTRUCTURES I

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V.2.0
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UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Common elements to all DCs

- Servers
- Building
  - Raised floor, suspended ceiling and cable trays
  - HVCA (Heating, Ventilation and Air Conditioning)
  - Power infrastructure
    - Including UPS – Uninterruptible Power Supply
    - Redundant systems, generators
  - Physical access control
  - Fire protection systems (active and passive)
  - Technical staff
    - And some room for these people
    - "Lights-out" or "dark" DCs are increasing
- Network + Storage

Type of Data Centers

Heterogeneous data centers (Your own. Colocation centers)
- Individual computing nodes / servers
- Individual / shared networks and storage systems
- Shared cooling, physical security and power distribution
- Can host servers from different clients

Homogeneous or *Warehouse-scale Computers* (Google terminology)
- Belong to a single organization
- (Relatively) homogeneous hardware & system software platform
- Run a small number of very large (data centered) applications
- Workloads are designed to tolerate a large number of component faults maintaining the service level of performance and availability
- Examples: Facebook, Google, E-bay, Amazon

High-Performance Computing Centers (or *Supercomputing Centers*)
- Belong to a single organization
- Homogeneous machines (usually clusters and grid)
- Intensive computational tasks
- Examples: Marenostrum, all Top500 computers facilities

Colocation centers

Equipment space and bandwidth are for rental
- Provide space, power, cooling, and physical security for server, storage and networking equipment of other firms
- Connect them to telecommunications and network service providers

Special features:
- You can rent cabinets or cages
  - Customers escorting, PIN, proximity card, biometric recognition (fingerprint, voice, …)
- Usually remote access, plus 7/24 technical staff available

Advantages:
- You pay power installed (kWh) + a rent depending on your space
- You safe the cost of building the infrastructure
- Fast to start, fast to scale

Inconvenient:
- Can you data be outside your building?

An example of Colocation Center: Global Switch

http://www.globalswitch.com/en

Nine centers:

- The biggest: East London (65,543 sq m, 45 MW)

Examples: Arsys (Logroño)

EL PAÍS

ECONOMÍA

ECONOMÍA EMPRESAS MERCADOS BOLSA MIS AHORROS VIVIENDA TECNOLOGÍA OPINI

En las tripas de la nube

• Arsys tiene en La Rioja un centro de datos de los más punteros del mundo

ANDRÉS GARCÍA DE LA RIVA | Logroño | 1 NOV 2014 - 22:48 CET

Archivado en: España Empresas Tecnología Economía Política Informática Ciencia Industria

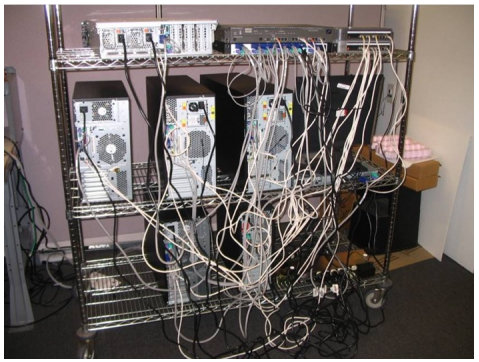
Centro de datos de Arsys en Logroño

Arsys tiene uno de los centros de datos más innovadores y

Servers

Tower servers

- It's OK when you have an small DC
- A lot of space in case >5 servers
- Problems with wires



Servers

Racks

- There is a standard measure: rack unit or U
- To mount on 19-inch (data equipment and servers) or 23-inch racks (telecommunications equipment)
- 1U: 1.75 inches (44.45mm) high
- Typical rack: 42 U (up to 48U)
- Pieces of 1U, 2U, … and so

- Interconnection using local Ethernet
  - Inside the rack
- Storage out of the rack

Servers

Blades

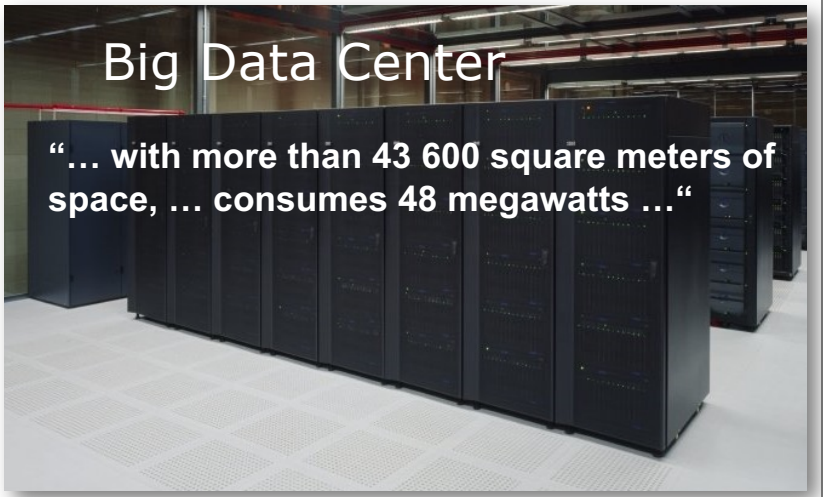
- The servers share the power supply, fan and I/O connectors
- An enclosure is required to host blades
  - Blade center, or chassis
- High servers density (8 to 16 servers in 6U or 7U)
- For increasing processing capacity without storage
- Can be connected to a central storage system using Fiber Chanel

Servers

Mainframes

- A whole computer
- Business oriented
  - High reliability and security
  - I/O extensive facilities
  - Backward compatibility
- IBM dominates the market
  - Actually IBM System z

Building

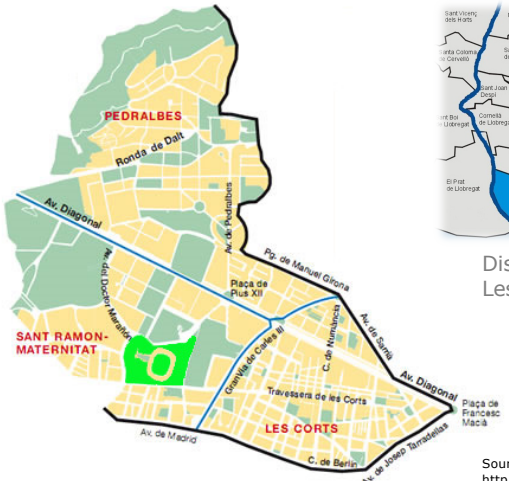


Source: *Tech Titans Building Boom By Randy H. Katz. IEEE Spectrum, February 2009*

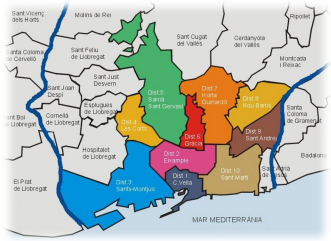
43.600 sq. meters

48 MW

Les Corts neighborhood (30,000 families)



Source:http://www.bcn.es/bcnbarris/ca/barrixbarri_districte4.html



Districts of Barcelona,
Les Corts coloured yellow.

Source:
http://en.wikipedia.org/wiki/Les_Corts,_Barcelona

Building a DC

Thermal and acoustically insulated

Geostrategic considerations:

- Good access to the net (Internet backbone optical fibers)
- Close to power generators
- Capex considerations (land cost, taxes power cost, average outside temperature,…)
- Physical communications
- Natural-disaster proof
  - Depends on the place (Tokyo vs. Barcelona)

Datacenter staff

Different roles and responsibilities

Head of Operations / Operations director

- Make decisions about the DC design
  - Choose the technologies used
- Design policies of maintenance, operation, backup, etc..
- Organize work schedule and assigns tasks to staff

System / network administration

- Install, configure and maintain networks and OS

Technical applications administration

- Install, configure and maintain applications on servers
- They can be hired to the software company

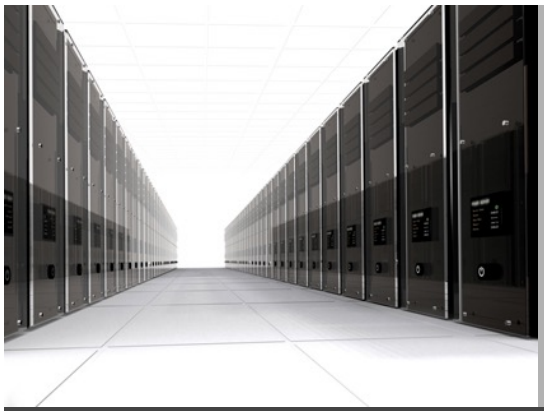
Operation

- Routine maintenance: hardware changes, changing magnetic tape robots …
- Monitoring environmental conditions of the room

Others

- Help desk, web design, …

THEY NEED SOME FACILITIES



DATA CENTER INFRASTRUCTURES

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