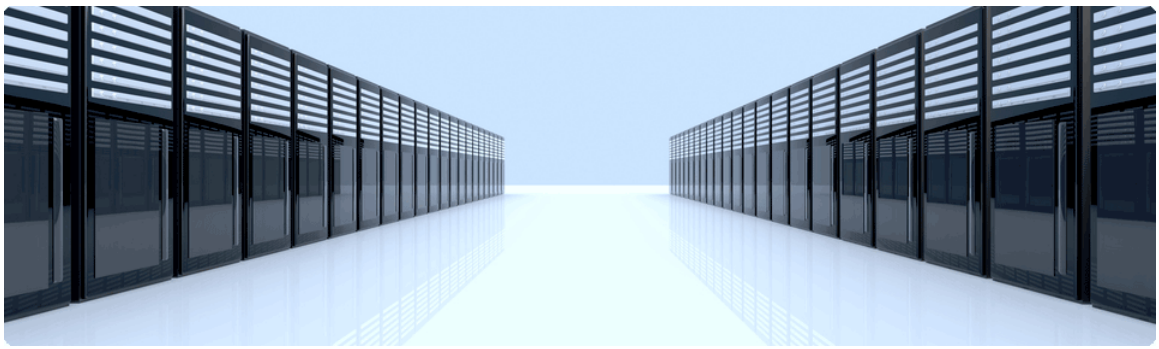
White Paper: What is a Green Datacenter?



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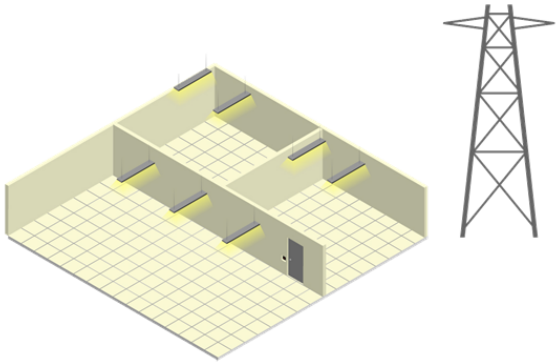
2.1. Introduction

This document will explain the difference between a traditional datacenter and a Green Cloud Datacenter.

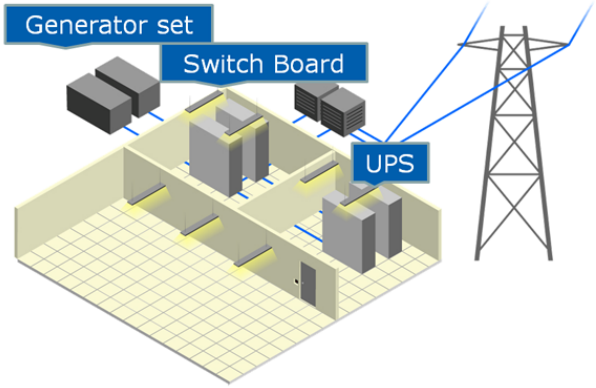
2.2. The construction of legacy Datacenters

Elements of a typical datacenter include:

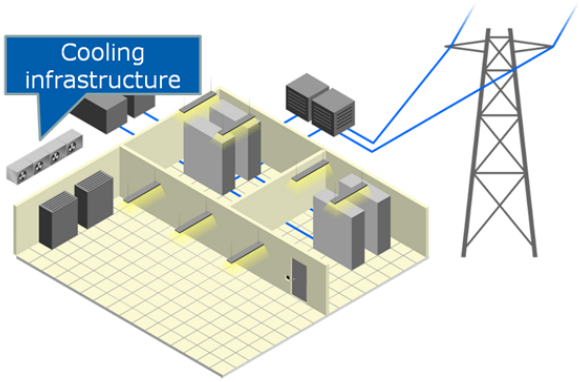
- Building & Power
  - A secure building, fully shielded against environmental influences with no windows
  - 1 or 2 external high voltage power feeds
  - Connection of high voltage feeds to transformers



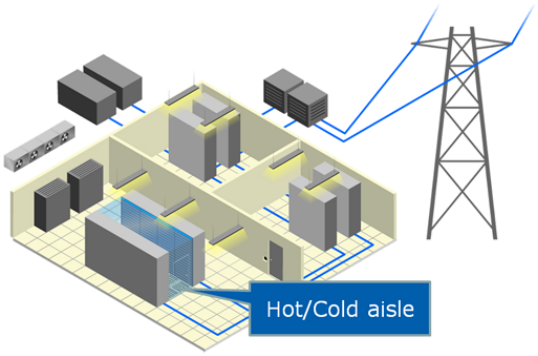
- Datacenter supply equipment
  - Uninterruptible Power Supply (UPS) to provide battery based power for a limited time in the event of loss of the primary electricity source.
  - Switch board room to distribute the power
  - Diesel generators to provide power in case of extended outage from the electricity utility provider



- Cooling equipment:
  - Chillers to cool down water used for air conditioning
  - Air conditioning units below the raised floor
  - Cooled air is blown into the datacenter rooms via perforated tiles



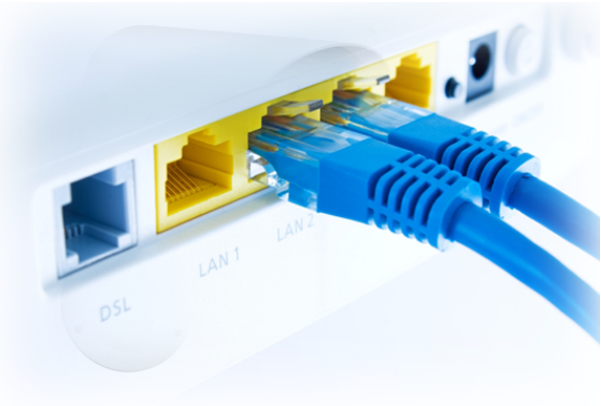
- Colocation rooms:
  - Private rooms (racks for a single customer) or shared rooms (Racks shared between multiple customers)
  - Datacenter customers hire between 1/4 and a full rack
  - Each room typically will include a raised floor with cables and aircon units below
  - Racks installation designed to allow customer servers to benefit from cooled air



- Cable trays
  - Power distribution delivered to the racks
  - Networking connectivity delivered to the racks
  - Building automation functions

- Building Automation equipment
  - Security cameras
  - Physical access security
  - Equipment status monitoring

- Networking equipment
  - Telecommunication Services Provider (Telco) connection point within the building
  - Connections between telco bandwidth and datacenter customers
  - Connections between datacenter customers
  - All connections are manually installed through cable junctions within the Datacenter Peering Room



This typical datacenter layout is often considered as best of breed, mainly because it is the most common design and has been used for many years.

2.2.1. Datacenter Peering Room

The Peering room is a key area within the datacenter for provisioning and managing connectivity between public, private and internal networks. Private Peering, Public Peering, Transit, Dark Fibre, Ethernet, MPLS (Multiprotocol Label Switching) and Leased lines can all potentially connect to the peering room. Private Peering is normally an interconnection between customers within the datacenter and the telcos or between datacenter customers. Public peering is often installed in the datacenter in the form of a public exchange switch so that customers can exchange data without the need to have a private connection.

If two customers in the datacenter want to be form a private peer, a dedicated cable can be run from each rack to a patch bay within the peering room.

The peering room is connected to the telco room that is used to provide external network bandwidth to customers within the datacenter. The high capacity trunk lines, often from multiple Telcos, will enter via this room then connect to equipment used to route the customers' traffic inside the datacenter. Customers peer with a telco that provides transit for data between that datacenter location and the outside world. For this transit service, the datacenter customer pays the telco a monthly fee, often based on a fixed number of Megabits per second (Mbps) maximum transfer rate. The transit agreements often allow peaks for short times or at a variable rate for an additional fee.

2.3. How legacy Datacenters are preparing to become greener

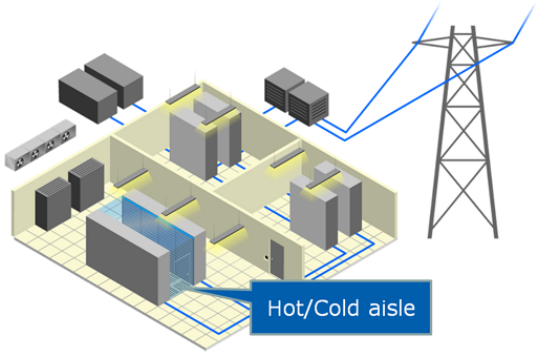
The rising cost of energy combined with environmental objectives to lower carbon footprints has led to much greater demand from both existing and new datacenters for methods to improve Power Usage Effectiveness (PUE).

There are several measures that datacenters are taking to become greener.:

2.3.1. Optimise the air conditioning system

Datacenters have started using hot/cold aisles designs to improve cooling efficiency.

Hot/cold aisle (or hot aisle/cold aisle) is a method of cooling servers in datacenters in which every aisle between rows of equipment racks is bounded with exclusively hot-air outlets or exclusively cool-air intakes. Air is brought into the cool aisles from underneath by perforated tiles and exhausted from the hot aisles overhead. This produces constant air circulation through the racks, provided there are no "holes" through which cool air can leak without encountering hardware.



In a hot/cold aisle configuration, the hot aisles are always at a much higher temperature than the cool aisles. Equipment racks are arranged in parallel rows. Air flows generally upward throughout the center with a constant "breeze" through each row. For optimum design, internal fans that bring air into or exhaust it out of individual units should be disabled or configured to act with, not against, the overall pattern of air flow in the center.

Many datacenters have applied hot and cold aisles but failed to install blanking panels to avoid mixing air. This is often because the building and aircon systems were not designed with hot/cold aisles in mind and cannot easily be modified for this configuration. The disadvantage is that hot / cold aisle still requires a lot of overcooling inside the server rooms which wastes a lot of energy.

When hot-aisle/cold-aisle is installed with raised-floor cooling the combination still causes a lot wasted of cold air. Even with blanking panels and with a laborious process of sealing all the gaps in the floor, there will be cold air in unexpected areas.

2.3.2. Improving the efficiency of UPS and power conversion

A lot of power is lost when converting it from high to low voltage. Datacenters are now investing in equipment that offers a much more efficient voltage conversion process.

However, servers that use low voltage power are still connected to higher 110V (US) or 220V (EU) supplies. The conversion from mains to useable internal voltages can results in a energy loss of up to 30%!

2.3.3. Buying Green power and lowering the carbon footprint

Electrical utility companies offer programs where companies can reserve energy out of their pool of ‘green energy’, often at a special rate. If the power used by a datacenter is generated by green energy, this is often a strong differentiator for customers with a highly focused green strategy. However, there is a danger that if a datacenter is not energy inefficient; the use of “green energy” will be seen as purely a marketing gimmick.

3. Article Contributors

Wilbert Ingels - CTO

Wilbert Ingels has 16 years of experience in the IT and Telecoms sector. Before starting with A-Server he was: Sales Director at Netcom Solutions, Sales Director at Level3 Communications Inc., European Director Business Development at Level3 Communications Inc., Vice President Sales at Dedigate/Terremark Inc., Senior Vice President Managed Hosting Dedigate/Terremark Inc., Chief Operating Officer Europe at Dedigate/Terremark Inc.

Wilbert is an engineer by education and an expert in datacenter design and power management. He invented several new concepts regarding power management in datacenters. He has several patents on his name for datacenter power technology designs.

Wilbert was the fouder of Racktivity. Racktivity did 2 succesfull funding rounds and is now headquartered in the US.

Next to its power experise, Ingels has on the field experience as CTO in previous ventures for multi datacenter design and management, data replication methods, security in datacenters, high volume infrastructure setups and disaster recovery in and between datacenters.

Wilbert is an Entrepreneur In Residence from Incubaid.
Wilbert is now one of founding partners of Dacentec and was co-founder of Dedigate, Racktivity & A-server before.

Arvid Fossen - Sales & Marketing Director

Arvid Fossen is a cloud computing market expert and has been a speaker and contributor at many cloud computing events worldwide. He has built his experience in this area at cloud computing solution vendor A-Server. He and his team delivered A-Server's private cloud solution DAAS.com. This cloud is a turnkey solution that includes hardware, cloud OS, control panels and API's, providing real agility via auto provisioning, self-healing, high redundant storage and scalability functions. A-Server delivers the cloud in their customers datacenters that can use that cloud to offer renewing pay as you grow and pay as you use hosting offerings, but also to built out web 2.0 projects and scalable storage.

Previously Arvid has held manager roles at Hostbasket, one of Belgium's leading companies in hosting that has been recently acquired by Telecoms Operator Telenet. At Hostbasket Arvid was responsible for product launches and executing strategic projects in the messaging and collaboration products.

Arvid started his career at Belgacom, Belgium's largest Telecoms Operator. Within Belgacom's wholesale division he was responsible for the product management of the local loop unbundling including ADSL and SDSL and also managed wholesale contracts for Belgacom's ATM Backbone network.

Arvid has a Master degree engineering from the Antwerp University and attended a Master Class marketing at Solvay.

Arvid is an Entrepreneur In Residence from Incubaid. Arvid is now one of the founding partners of Dacentec and was co-founder of A-server before.