# DESIGN OF GREEN DATA CENTER

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## Abstract

*In modern days, we use computers and resources very frequently without considering their harmful effects to our environment. Green computing is a technique by which, we use computers and its resources without harming our ecosystem. Green computing is the way to use computer related work doing with eco-friendly. This is new Data Center Design Paradigm that includes the architecture of processor and other computer appliances. The most important objective in green computing is to design a processor with low consuming power energy, followed by designing of Data Centre of many servers that consumes less energy to prevent harmful effect of our environment. In this paper, we will discuss what green computing is and the concept and design of a proposed Data Center.*

*Keywords - Green computing, Data Centre, Eco-Friendly, Energy Efficient.*

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## 1. INTRODUCTION

Today, the major concern or problem is our survival on earth without any harm to our environment i.e. to live an eco-friendly life. Green computing is a way to reduce carbon emission gas produced through computers and computer resources used in our day to day settings like data Centre, hardware equipment and software processing etc. Green computing improves the efficiency of the computer and its individual parts namely processor speed, ram speed, memory, etc. with less consumption of power.

Many big companies are using green computing to reduce power consumption and cost in order to allow them to increase profit by reducing energy cost through high efficiency. It is very crucial for environment safety. Statistics show that a single Big Data Centre can consume energy equal to one small city.

The cooling system in data center or section is the major power consumption segment that needs to be optimized. This paper addresses this problem and explains how to go about designing a cooling section of data centers and proposes architecture that supports this new cooling section design.

Software is also major thing in computer. Software is also affecting our environment with speed form of work.

If some work doing in software like Microsoft word for making word file, assume that we are making only five pages of word file in MS word but they take more than one hour. Actual time is less than 25 minutes for complete this work so computer can work more than one hour unnecessary due slow of software. Green computing is used in software design, architecture, and high speed of access software.

## 2. THE NEED FOR GREEN COMPUTING

The Fundamental working concept of Green computing is based on the working of computer and it resources with better efficiency, high speed of access, low power consumption and less size etc.

## 2.1 Efficiency

In older day computer were taken more power consume, less perform the work due architecture of computer.

Today we see computer and its resources are very small architecture but they work quickly with more efficiency by adopting green technology to develop computer hardware, software with any impact of environment. In figure 1 there given the changes of efficiency according processor. Power is also the major approach to save environment because we are using computer and other resources they taken more energy other than any work.so it is very important part in green computing. You take Quad- Core Intel Xeon Processor E5345 isn't a reckless CPU than Intel is presently carrying. Intel's extra influential CPU, Xeon Processor 7140N that tracks at 3.33 GHz but it consumes only 150 w.[1]
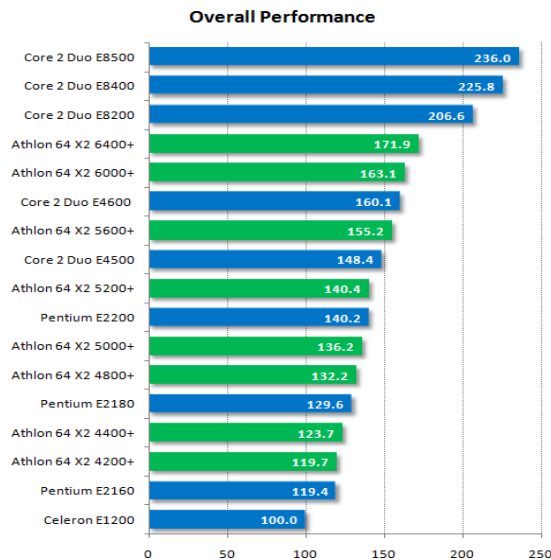
**Fig 1**

## 2.2 Power Management

Just few years ago consumption of power by data Center is hugely. The different department was paid cost of energy but no other one track was similar to like it. Now a day things is different due to risen operating capacity is risen.

In Figure [1] illustrate about the statistical of power consumption (idle) at processor. In this figure showing the power consumption at different processor with timeline. Than it comes to the Quad FX and V8 systems, these dual modes of socket platforms obviously consume large power as they have another power hungry processor to keep process running. Another reason for the large jump up is due to the chip sets that the motherboards use on the Quad FX and V8 platforms, so remember not the Watt increase only to the CPU.
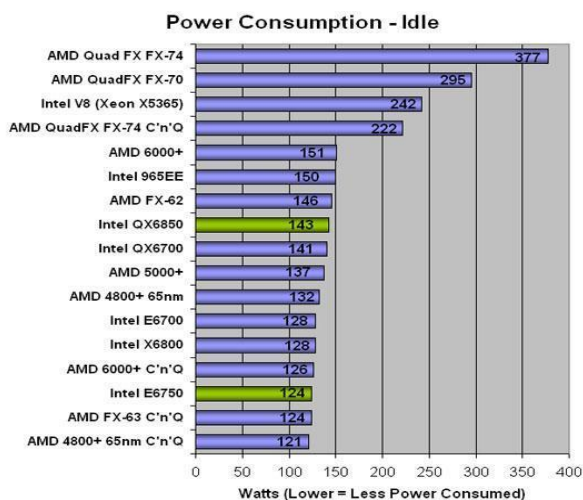


**Fig 2**

## 3. DESIGN OF DATA CENTER

Data Center is a part of computing in which the facility for a large housing of services and data stored. It is essential for storing all record in a server.

Cooling is a major factor in every data Centre which is required to maintain the data Centre temperature. Every year Big data Centers spend huge amounts of money for electricity consumption which is primarily due to the cooling process at data Centers. The architecture of data Centre can indirectly influence the consumption of electricity during cooling process. A good architecture for data Centre means less amount of energy consumption.

The size of a data Centre is equal to 12 football grounds. [2] (ref figure 3). i.e we can assume that 100k servers that consume the energy of 100 MW.[2] The energy required is equal to one small city, thus designing of data Centre is very important part to reduce energy level.
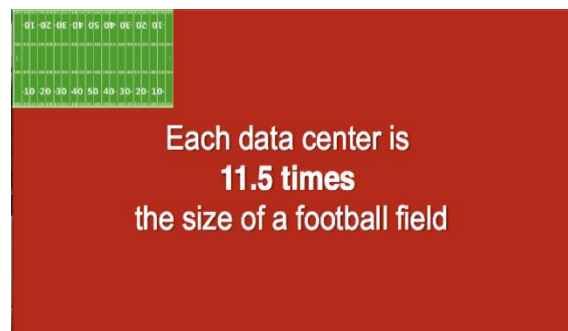


**Fig: 3**

There are four major factors that affect the reduction of energy consumption in data Centers. They are given below:
- Reduce Data Centre Hot Spots
- appliance of virtualization schemes
- Consolidate Storage
- Design the Accurate Infrastructure

### 3.1 Reduce Data Centre Hot Spots

Hot spots have been attributed to a reduction in reliability and system outages (A temporary suspension of operation, especially of electric power.), and have been associated with computer hardware equipment manufacturers threatening to void sure or maintenance understanding. Cool centric thermal systems enable identified data center equipment cooling and eliminate data center hot spots.

### 3.2 Appliance of Virtualization Schemes

Mostly server is not virtualized than only 15-25% use processors capacities. But it needed to full memory capacity of processor. So we are using the technique of virtualization to fully utilization of processors capacity [3].

-Through Physical and virtual environment of data center executives are pursuing constant environment network. So physical and virtual servers can use a similar configurations, plans and management implements

-Several data center levels and storage operations have been configured without usual feature of reflection to heat delivery. Formerly tools have been put in this place, than relief of data center hot plugs without worrying   any uses to be tough. Items to reflect include is  Virtualization can service to iterate of hot plugs minus troubling the applications, but practice of more than one managers will ingest extra power and it involve more cooling and space of the managers.

By using IBM VIRTUAL FABRIC integrated 10GbE connectivity, than it give more flexible high speed of  network with lowering purchase costs of  the technology by more than 30%.[4] .Fabric of the virtual machine to giving faster  supports and networking.

## 3.3 Consolidate Storage

Different kind of storage is ineffective because valued are normally underutilized, worsening capital stock in storage structure, and an green guard, unreasonably overwhelming more power, cooling, and space capitals. Element to consider are: Administrations should judiciously estimate of their upcoming data storage capacity and its routine involve. This technique will help to confirm that they don't extension capacity or sensation additional system disadvantage, correctly realized storage merging can reduce administration density by minus number of storage devices, consolidate management and plane. Consolidated NAS (network attached storage) can help to lift down costs of, data center step space, cooling, and power.

## 3.4 Design of Accurate Infrastructure

Material of building is also most important part of designing of good data center, so here we are giving some different type of material which cannot affected to data center for producing the harmful gases.

**Stone and Recovered brick:** Using of domestic stone and brick has become so widespread in building plans that businesses have arisen that are completely dedicated to providing and gathering such materials.

**Green insulation:** Entirely structure insulation is a fundamentally green because it increases energy productivity. Fibre insulation is  measured even olive green than predictable fibre glass insulation because it is finished mainly from recovered from Newsprint. Additional selection is natural fibre insulation made by scrap denim, recovered by clothing factories and then destined for the garbage.

**Drywall or Synthetic gypsum board:** Mostly power plant's coal combustion having waste product like fly ash, synthetic gypsum that created sulphur dioxide. Acid rain has a sulphur dioxide gas so using flying ash in concrete and employing synthetic gypsum that keep waste material of landfills[5]

 Data center administrators should certify that merchants offer qualified services for virtualization techniques, which top to better-quality of power productivity and more financial cooling schemes.
- Consumers must gaze to merchants to proposal expert services that will benefit them of design and the supreme storage architectures and escape overbuilding capability, which pointers to sophisticated ecological and wealth costs

## 4. INSIDE COOLING MANAGEMENT SYSTEM

Data Centre has grown-up without enough supposed  to future cooling and power requirements. One time a storage shelf is placed on the data Centre level it is hard to move without affecting disruption of applications. Substances to   contain of server supports and storage which are designed through cold rows and hot rows. Then, the back row is a conscious of the Dissipate from the nearby front row.  There are many data Centre designs but hoc sever Cabinets dedicated to server. In figure 4 illustrates, hot and cold air are mixed near the roofs and is retrieved     into the CRAC (Computer Room Air Conditioning) [6].
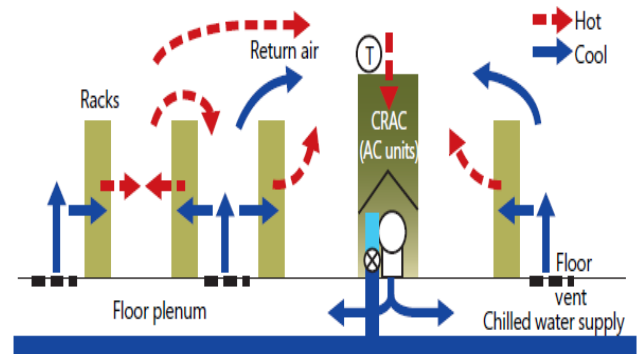


**Fig 4**

Data Centre operates by minimizing the energy CRAC consumes although at same time ensuring that server operations are not negatively exaggerated by high temperatures.
- ➢ Using free air or natural cooling technique to cooling the data Centre.
- ➢ Large data Centre to make in cooling place like identic, where only cold area.  In this area cooling percentage is  less consumed power due less amount of data Centre used for cooling
- ➢ Another way to design the data Centre inside of

fortification (bunkers) like underground area.
- ➢ In data Centre using low power server which are operated all server with low consumption of energy.
- ➢ Using the Virtualisation software, they extend the functionality of existing server decrease power intake, according to the Data center diminuendos Intellect Power report. This report expects that virtualisation will performance a huge part in raising the operation of the current plantation from below 10% to over 40%.
- ➢ Optimizing airflow in data centre for getting maximum level of cooling.
- ➢ increasing a data centre's thermal wrapping.[7]

## 5. OVERALL ARCHITECTURE OF DATA CENTRE

In architecture of data Centre contain both things physical and Cyber properties are measured to produced tools and models for performance optimization. In figure 5 illustrate, facility layout, server performance ,data archiving, data staging genome ,data presentation, tools, real time monitoring, capacity management.
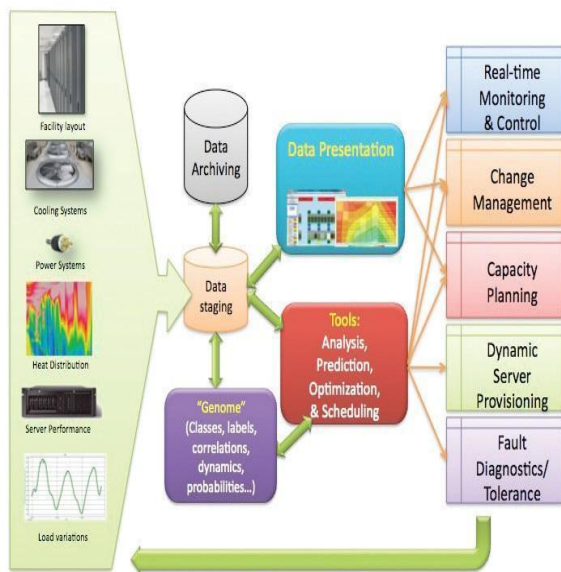


**Fig 5**

- ● **Facility sketch** –
  CRAC, The shelf, and power circulation sketch not only afford a basis a data performance, but it also distress cooling eventually and productivity, data centre capability.

- ● **Power organization**:-
  Moreover uncritical power disbursed through the power split system and cooling, complete checking of the power consumed by several IT tools is most vital.

- ● **Cooling organization**:
  The cooling organization contains kit such as CRAC, air economize, water chillers, and moisten which are classically examined by the structure administration system through a Regulatory Control and Data Acquisition (SCADA) system. The cooling part ingests a bulk of an uncritical electrical load of the data center.

- ● **Ecological circumstances:-**
  Physical things, like as temperature separation, have a conventionally tough to gather at fine refined. The RACNet system tackles this main contest.

- ● **Server presentation:-**
  Server actions are usually characterized by the deployment of main mechanisms like as disks, processors, memories , and network card. Calculating these routine pledge-works is the main to an accepting how to heat is created by numerous servers.

- ● **Deviation of load:-**
  Network and server load can generally be dignified by the network actions for the online service hosting. Through presentation level understanding, more expressive cursor of system load, like as queries per second or congruent users, can be consequent.[8]

## 6. CONCLUSIONS

Green data Center is a new things, this is technology to reduced power or energy in data centre and computer belongings. It's mean to reduce an overestimate of IT business budget. By using the technique of virtualization to reducing the number of server, by this maximum benefit of data Center Corporation

Now a day computing industry is very important things to more preparation of architecture of pc and its resources. Mostly computer things are not good for our environment, but we are trying to use without any harmful effect of our nature.

In lastly to adopt only those data centre which is not affected our nature, like today Google, hp, dell, Apple. Microsoft and other big industry using green computing to save our environment and also saved his money for business

Now Google and other big company cannot release any harmful gas comparison vehicle. Because they are adopted the green technologies, i.e. one month use of google can only releasing a carbon is equal to driving of a car 1mile.[9]

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