



# How OCP affects the efficiency of a data center

What can we remove from the system?

Can we raise operating temperatures and have the servers survive?

Can we increase server delta T and relative humidity operational ranges to make the system much more robust and efficient?

Do we need a centralized UPS, PDUs, or chillers?

RESULT: OCP Data Centres PUE 1.1

# Why 19 inch relay racks ?



Module



Container

# Why 19 inch racks... are not sacrosanct

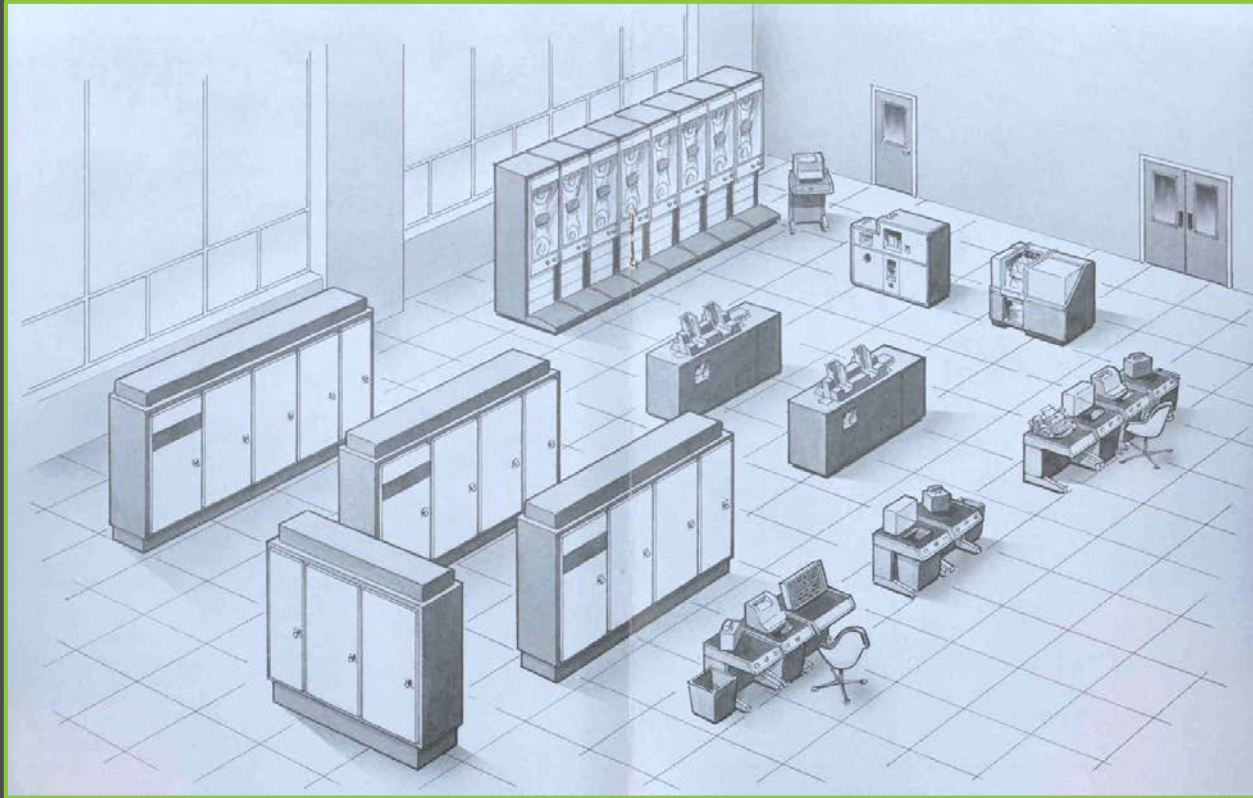


Module



Container

# Why accessible false floors in computer rooms ?



# Open Rack Unit innovations - Server fans “Cube Law”

40 mm  
Fans



EIA  
“U”

80 mm  
Fans

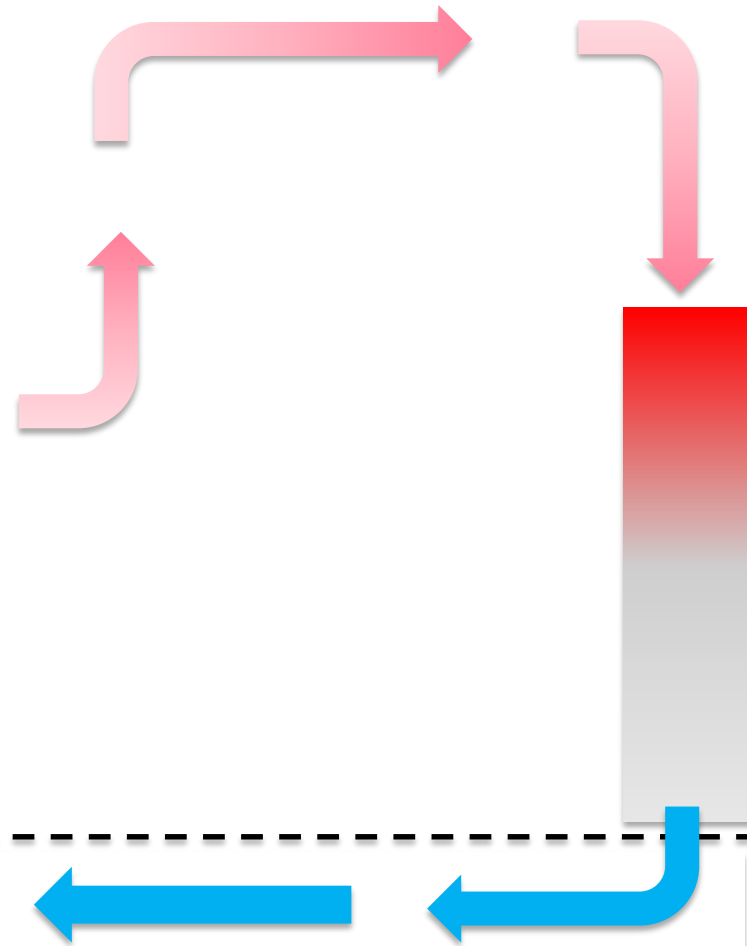
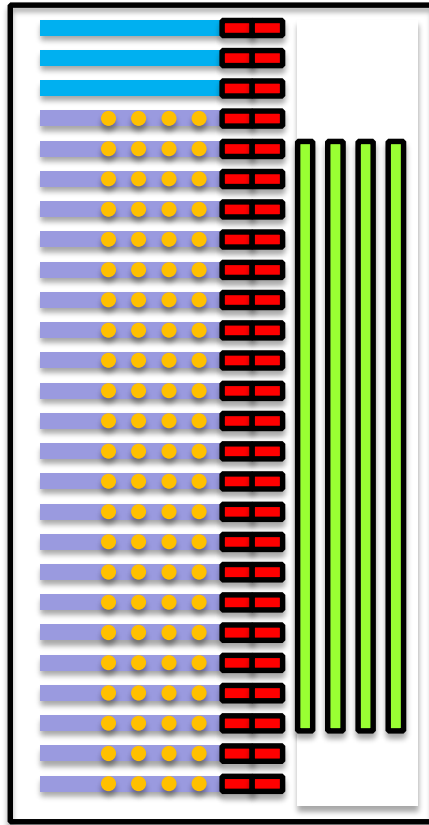


OCP  
“OU”

20<sup>th</sup> Century Dröss removed by OCP :

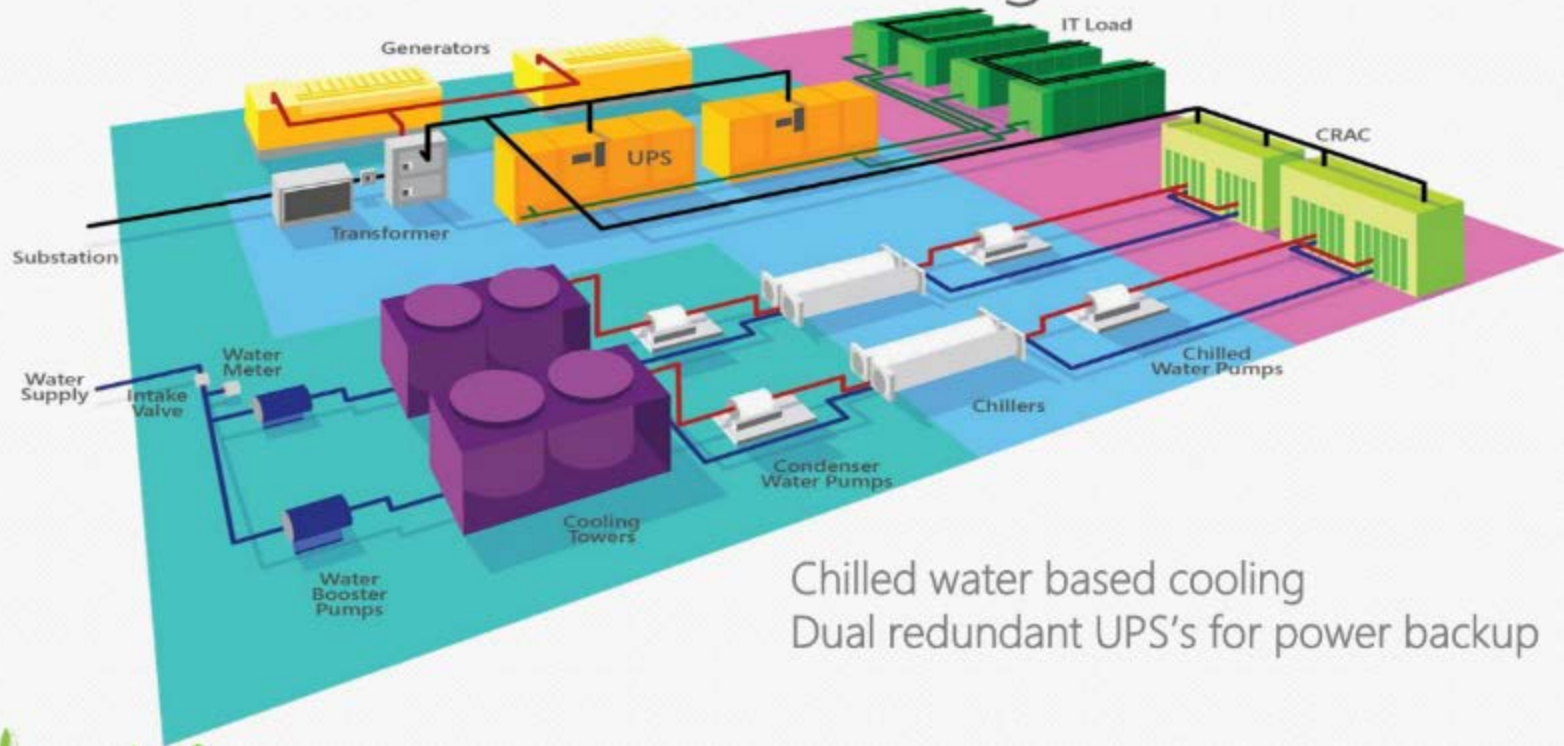
2 x TOR Switches  
4 x Pluggable optics  
86 x PSU's  
208 x 40mm Fans  
4 x AC Power Strips  
86 x IEC rear power cords  
120 x RJ45 rear patch cords

N+1 CRAC units  
Access Floor  
Cables in floor



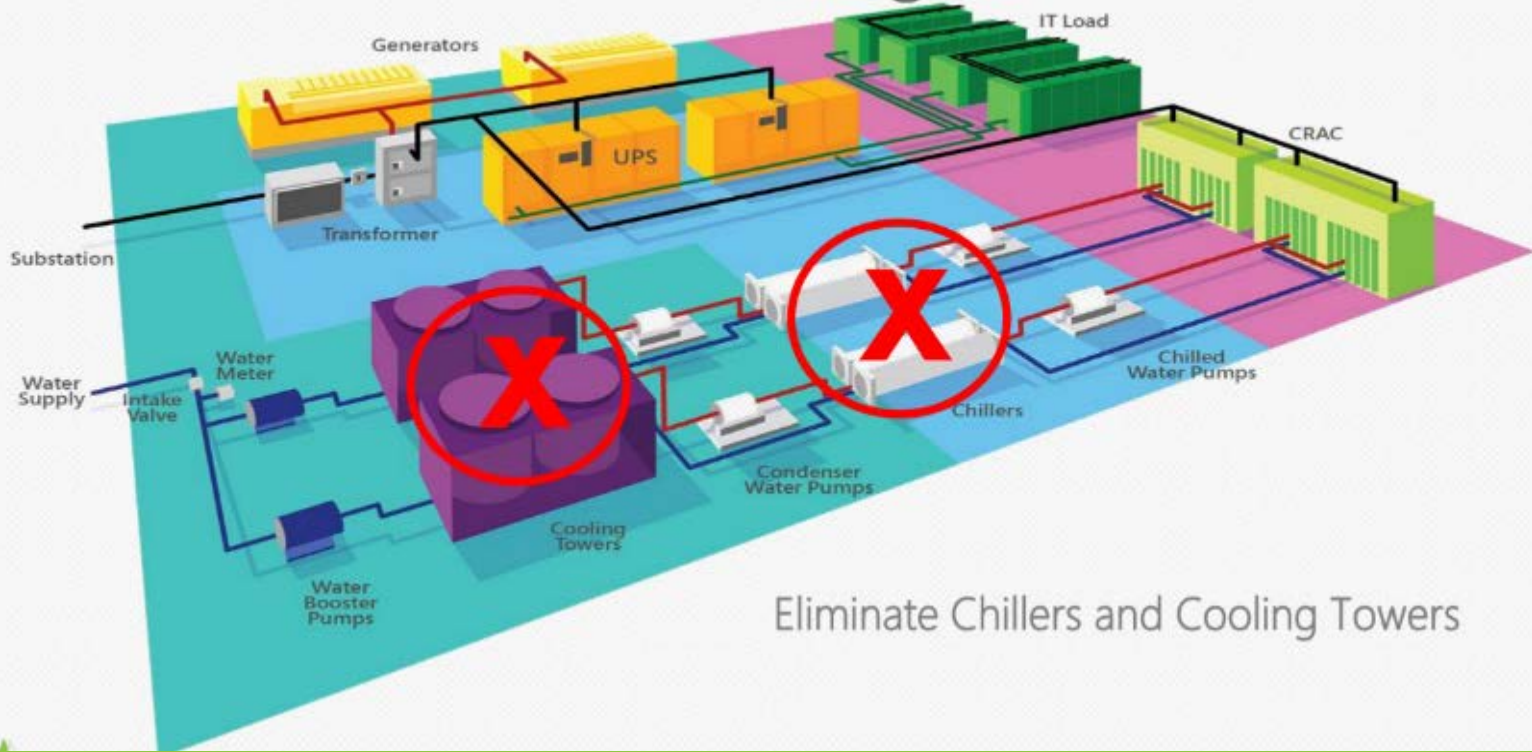


# Traditional Datacenter Design



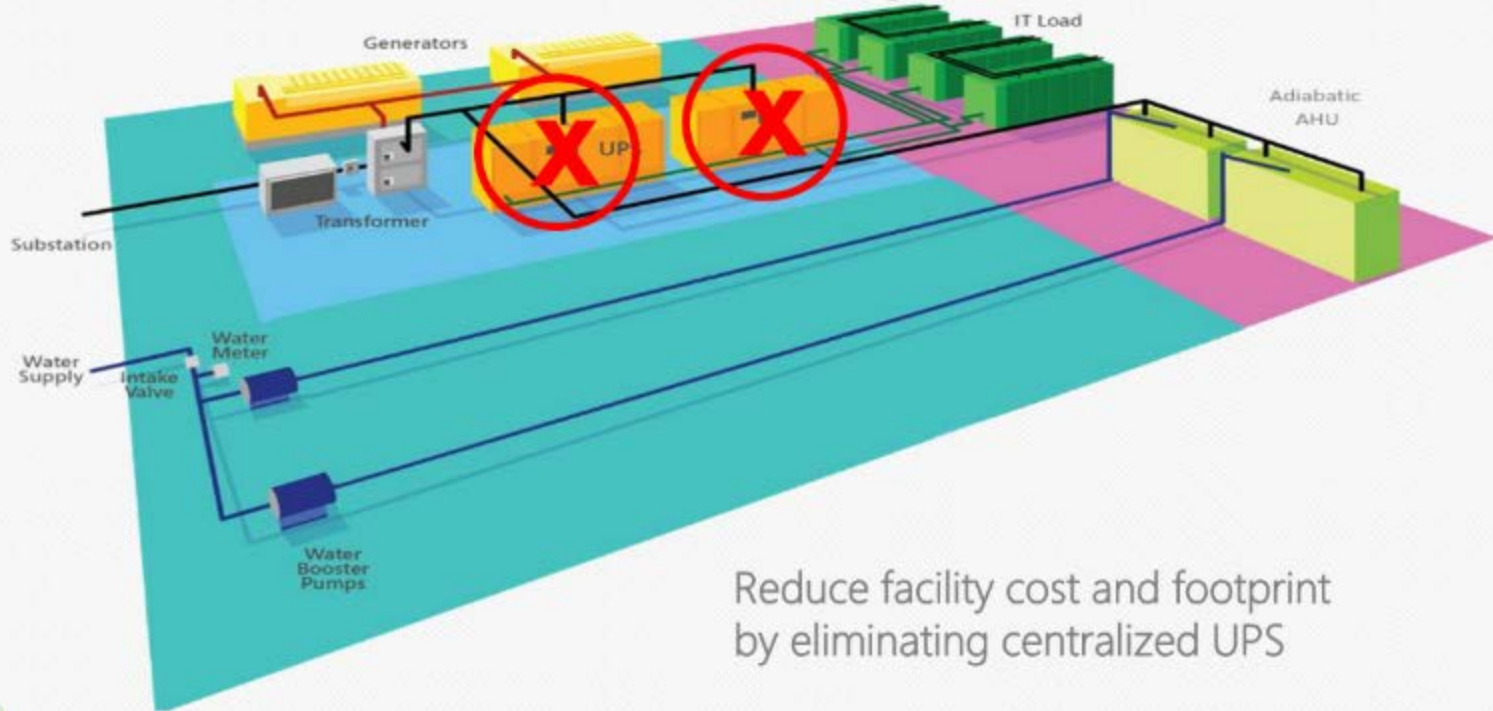


# Modern Datacenter Design



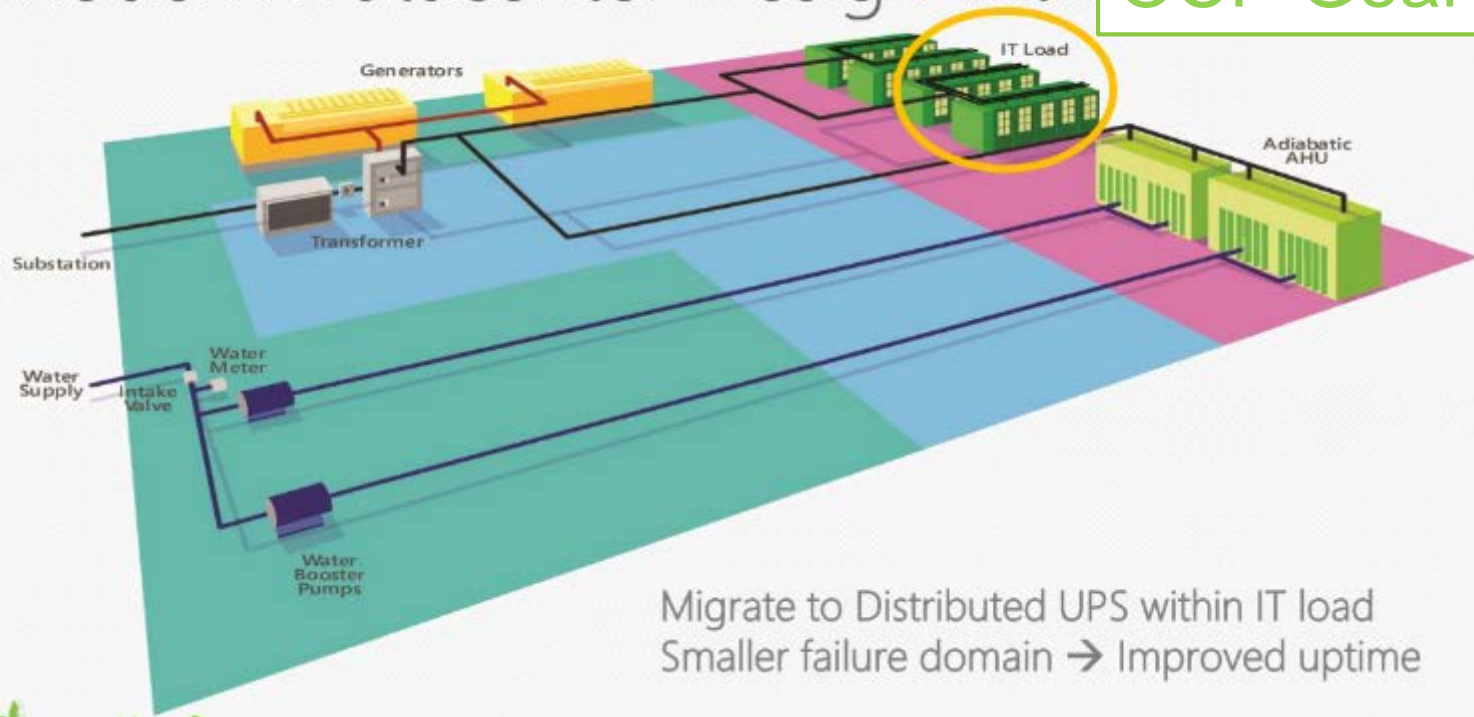
Eliminate Chillers and Cooling Towers

# Modern Datacenter Design



Reduce facility cost and footprint  
by eliminating centralized UPS

# Modern Datacenter Design with OCP Gear



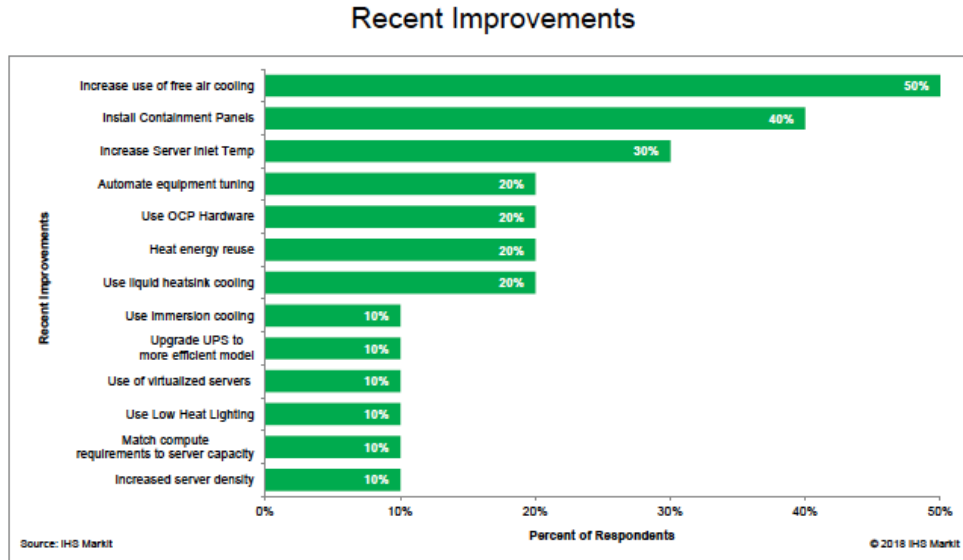
Migrate to Distributed UPS within IT load  
Smaller failure domain → Improved uptime



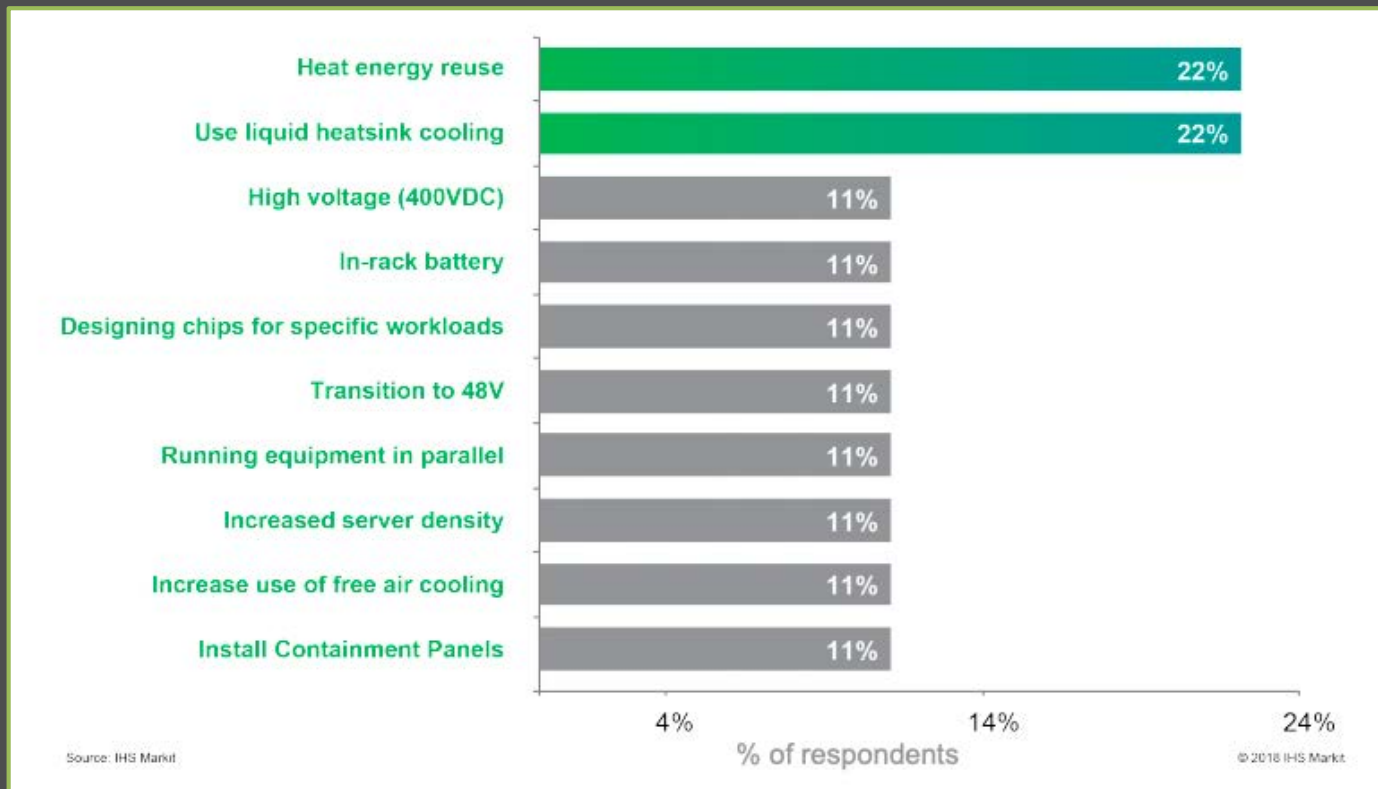
# The Numbers..and impact on Europe

# What recent improvements have you made to your data center's energy efficiency?

- Improvements to address cooling costs are top focus for data center energy efficiency improvements
- Energy reuse important strategy, sometimes overlooked
- Optimizing compute efficiency limits need for additional cooling
- Elements on the horizon: software to automate cooling controls, OCP equipment



# What plans do you have over the next 2 years to improve data center efficiency?





# Combined Heat & Compute (CH&C)

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## Facebook's Denmark data center will supply heat to city

Odense's district heating will get 100,000MWh of social hot air

September 08, 2017 By: Peter Judge


[f](#) [t](#) [in](#) [v](#) [G+](#) [e](#) [+](#)

Facebook's planned Danish data center will supply hot air to the district heating system of the nearby city of Odense, when it opens in 2020.

When the site is built, Facebook's waste heat will be boosted by a heat pump, and delivered as hot water into a heating system run by local firm [Fjernvarme Fyn](#). Odense is the third largest city in Denmark, with 175,000 citizens - and Facebook believes it will supply up to 100,000 MWh of energy per year waste heat could warm up to 6,900 homes.

### Renewable energy

"At all of our data centers, we look to make our operations as sustainable as possible, but our ability to recycle heat from our servers is unique to our Odense data center," says an announcement on the [data center's Facebook page](#) (of course). "This was made possible due to our close collaboration with the local district heating company Fjernvarme Fyn and its existing district heating network."



Facebook's projected Odense data center  
— Facebook

Data Centres used as heat generators

Higher exhaust air temperatures possible on OCP racks

Liquid heat transfer systems being hacked in OCP



15 Years and 350000 servers  
of Liquid cooling!!

-Octave KLABA Founder and  
Chairman OVH

<https://www.opencompute.org/events/past-summits>

#### LIQUID COOLING



COMPANIES > GOOGLE (ALPHABET)

### When Air No Longer Cuts It: Inside Google's AI-Driven Shift to Liquid Cooling

The company's latest AI processors drove its data center power density to unprecedented levels.

Alphabet CEO Sundar Pichai shows a photo of a liquid-cooled TPU in a pod inside a Google data center at I/O 2018.



DESIGN

### Alibaba to Use Own Immersion Cooling Tech in Cloud Data Centers

View of Alibaba's cloud data center in Chun'an County, Zhejiang Province, China. (Image: Alibaba video)

Plans to contribute technology to Open Compute Project

## Lenovo bets big on liquid cooling going mainstream, launches Neptune

Liquid cooling in the data center was usually reserved for supercomputing. Lenovo is betting that cooling techniques will go mainstream.



By Larry Dignan for *Between the Lines* | June 19, 2018 -- 12:00 GMT (13:00 BST) | Topic: Data Centers

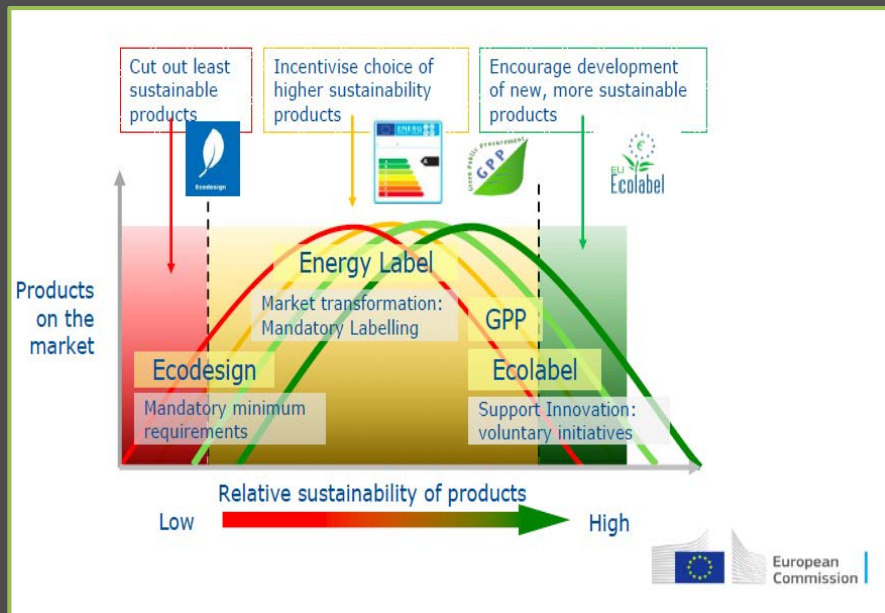
# The Ecodesign Regulation on servers and data storage products

## Paris Agreement & EU sustainability objectives

- Strong cross-border dimension of the cloud
- Contributing to the Sustainable Development Goals

## EU sustainability targets compared to 1990 levels: 2020-2030-2050

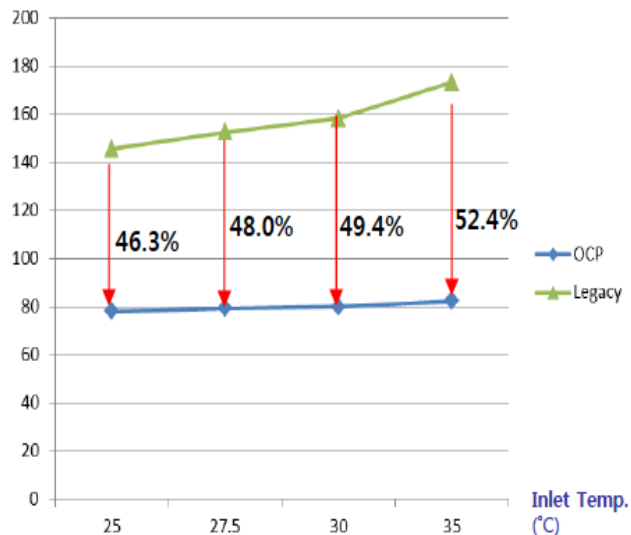
- Decrease in GHG emissions 20%, 40%, 80-95%
- Renewable energy 20%, 27->35%, 75-97%
- Improvement in Energy efficiency 20% 27->35% 41% (vs 2005-6 peak)



# OCP Power Consumption Comparison

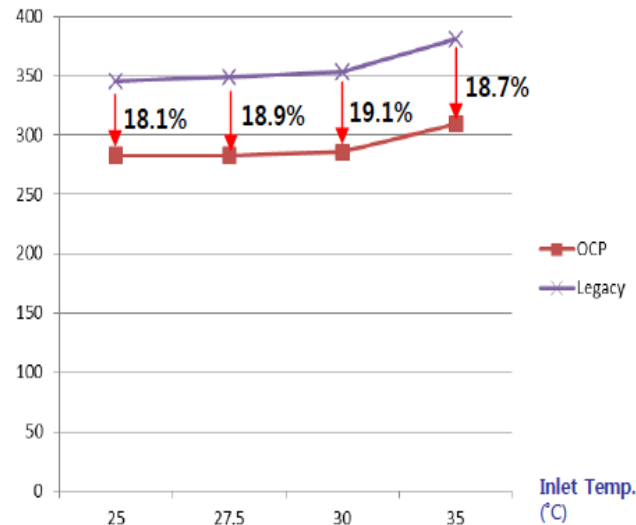
Power Consumption  
(W/Node)

## Workload 0%



Power Consumption  
(W/Node)

## Workload 100%





## GOALS

- Wanted a new network architecture that offered quick development of new features, better resilience and robustness
- Make deployment more modular, cost and energy efficient
- Adopt automation to manage complexity
- Improve interconnect across data center sites, providing for better redundancy and transparency for workloads
- Improve density and maximize space utilization in data centers

## NEW ARCHITECTURE

- Migrate from chassis based to fixed switch architecture
- Adopt disaggregated approach with switches from Edgecore and switch OS from IP Infusion

## RESULTS

- 40% reduction in energy consumption
- Over 50% savings in space
- Move to 100G, ready for 400G
- Increased troubleshooting visibility



CERN : 29% less energy @ 80% utilisation



RISE : Energy studies with more than 1,500 OCP servers

**Booking.com**

Booking.com : 40% less energy compared to blades

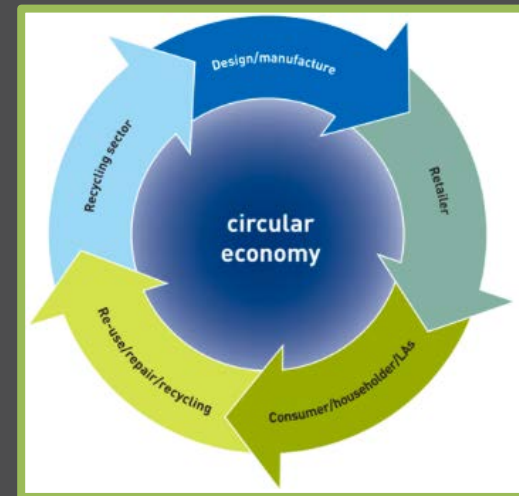
<https://www.opencompute.org/events/past-summits>





## Hyperscaler OCP hardware re-use

Enabled by the  
removal of  
gratuitous product  
differentiation



<https://itrenew.com/>



Communities are driving innovation



Data centers operators are looking to new open designs



There is real impact happening across Europe

# ....a thought for your day

If current OCP designs and practices were applied world-wide today the energy consumed by all the world's data centres would **reduce by more than 50%.**

[www.opencompute.org](http://www.opencompute.org)

# THANK YOU

[www.opencompute.org](http://www.opencompute.org)

IHS Energy Study & LINX: <https://www.youtube.com/watch?v=NrhYGjgzFXs&feature=youtu.be>

Booking.com: <https://www.youtube.com/watch?v=1qIOptRGL2c&feature=youtu.be>

SK Telecom: <https://www.youtube.com/watch?v=BBcFXAXXqRE&t=127s>

Europe eco-design regulation: <https://www.youtube.com/watch?v=GwFMMPvAFSo&feature=youtu.be>

OVH Advanced Cooling: [https://www.youtube.com/watch?v=\\_y1ELNs7B\\_k&feature=youtu.be](https://www.youtube.com/watch?v=_y1ELNs7B_k&feature=youtu.be)

OCP Event Presentations: <https://www.opencompute.org/events/past-summits>