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Innovation is Freedom

Energy Efficient Datacenter

Thursday, 4th May 2017

Speaker: Julien Costagliola di Fiore

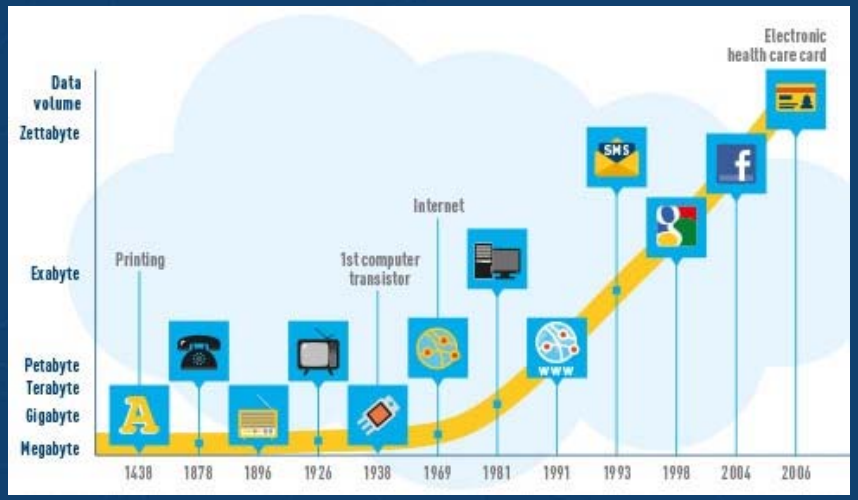
Summary

1. Digital revolution
2. OVH Group
3. Energy Efficient Datacenters
4. OVH Smart Datacenter Solutions

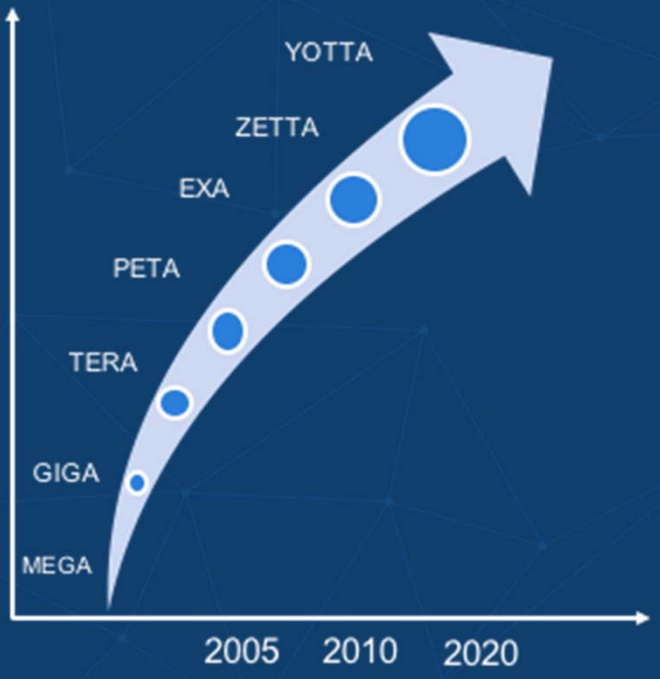
PART 1

Digital Revolution

Exponential Growth of Data Volume



(source: Federal Association for information Technology)



Datacenters take full advantage of the Digital Revolution

- 50 billion objects connected in 2020. Currently, we are at less than 20 billion around the world. Enormous number of devices, coupled with the sheer volume, velocity and structure of IoT data, creates challenges, particularly in the areas of security, data, storage management, servers and the data center network, as real-time business processes are at stake.

- Hyperscale data centers will double from 259 in number at the end of 2015 to 485 by 2020. They will represent 47 percent of all installed data center servers by 2020.

- Global data center traffic is firmly in the zettabyte era and will more than triple from 2015 to reach 15.3 ZB annually by 2020.

(source: cisco)

Data Center Growth

Global Data Center IP Traffic Growth

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Smart Cities - IoE

(source: cisco)

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Datacenters are significant power consumer

- The datacenters of « Grand Paris » will consume in 2030 as much as a 1 million inhabitants.
- Datacenters account for about 4% of the world's energy consumption, growing by nearly 5% per year, according to estimates from the Electric Transmission Network.
- Assuming current trends continue, in 5 years U.S. national energy consumption by datacenters is expected to nearly double, to nearly 100 billion kWh.
- Forbes published an article co-authored by Peter Huber and Mark Mills. The title was “Dig More Coal - the PCs Are Coming.” The premise of the article was to challenge the idea that the Internet would actually reduce overall energy.
- Assuming state-of-the-art energy efficiency practices are implemented throughout datacenters, the projected energy use can be reduced by up to 55% compared to current efficiency trends.

PART 2

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Our **Datacenters**

17

In Operation

12

Planned

for the next 2 years

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Our Datacenters
BHS
x4
GRA
x1
RBX
x6
SBG
x3
PARIS
x3


RBX
GRA
UK
NL
SBG
BHS
PL
US
PARIS
SG
DE
AU
ES
IT
x6
x1
x4
x3
x2
« OVH » existing DC
« Mini » new DC
« OVH » new DC
Our Datacenters Expansion
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A Worldwide **Fiber Network**

10

Tbps

32 PoPs /Points of Presence (USA /EMEA /ASIA)

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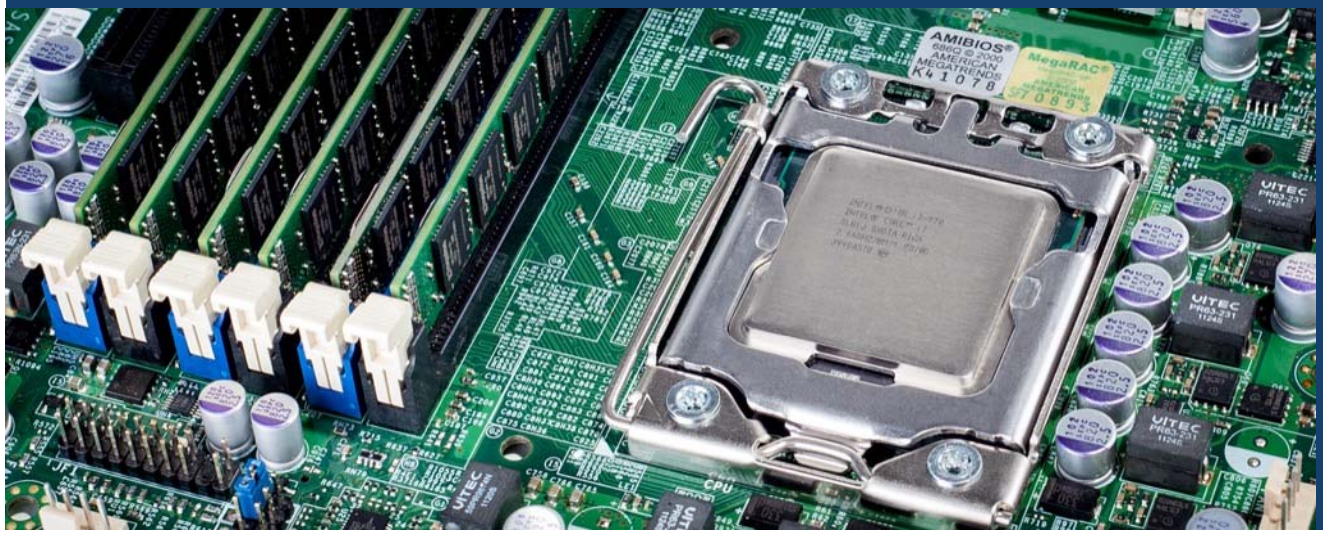
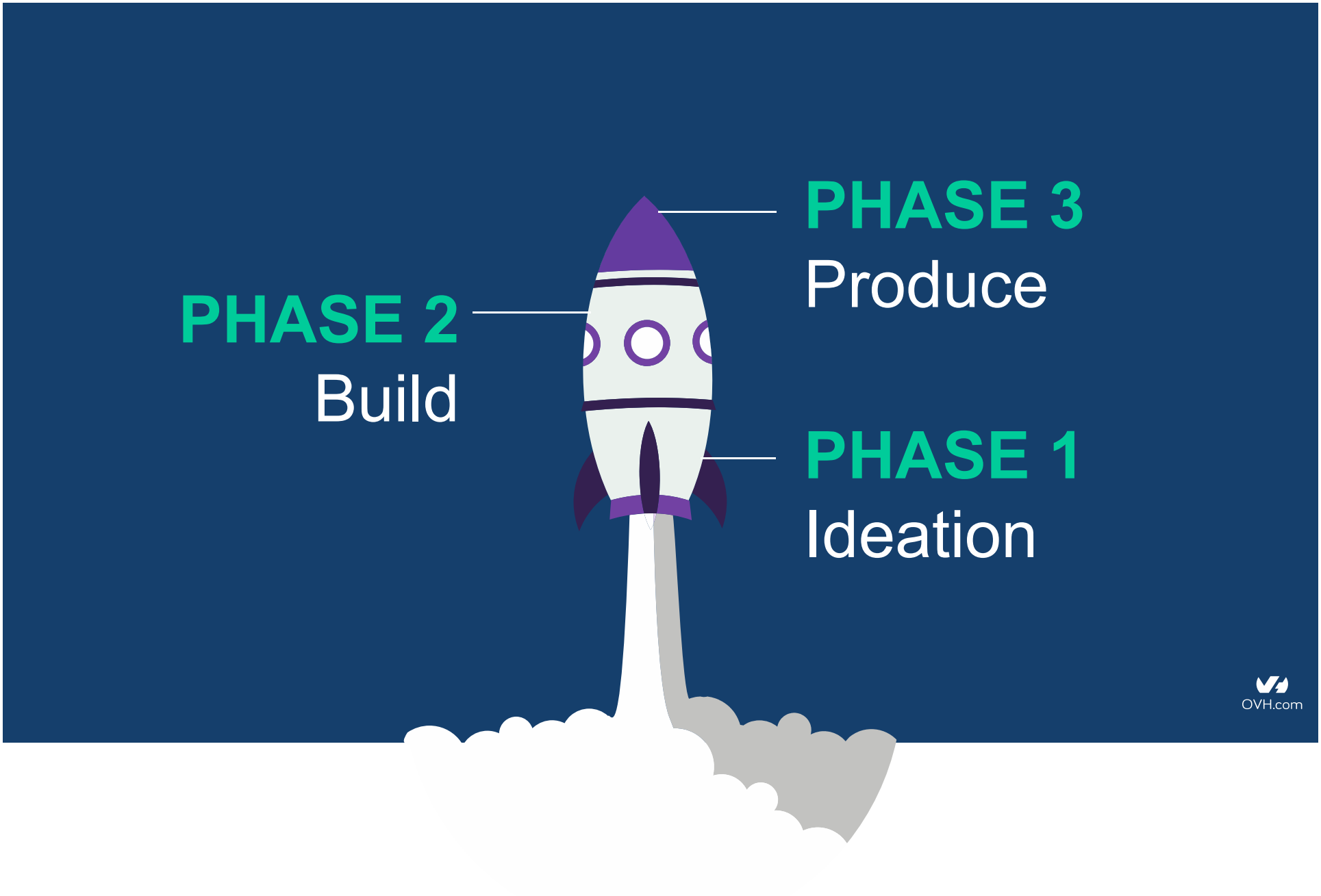
Permanent **Innovation**




PHASE 3
Produce
PHASE 2
Build
PHASE 1
Ideation
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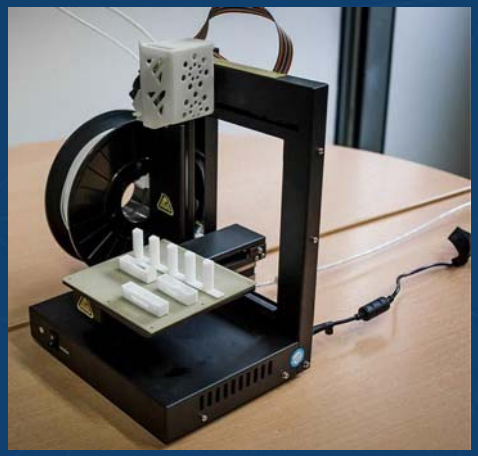
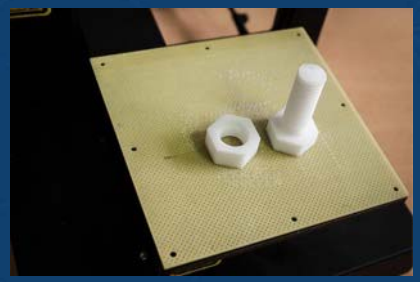
OVH R&D

3D Printer & Fiber Laser





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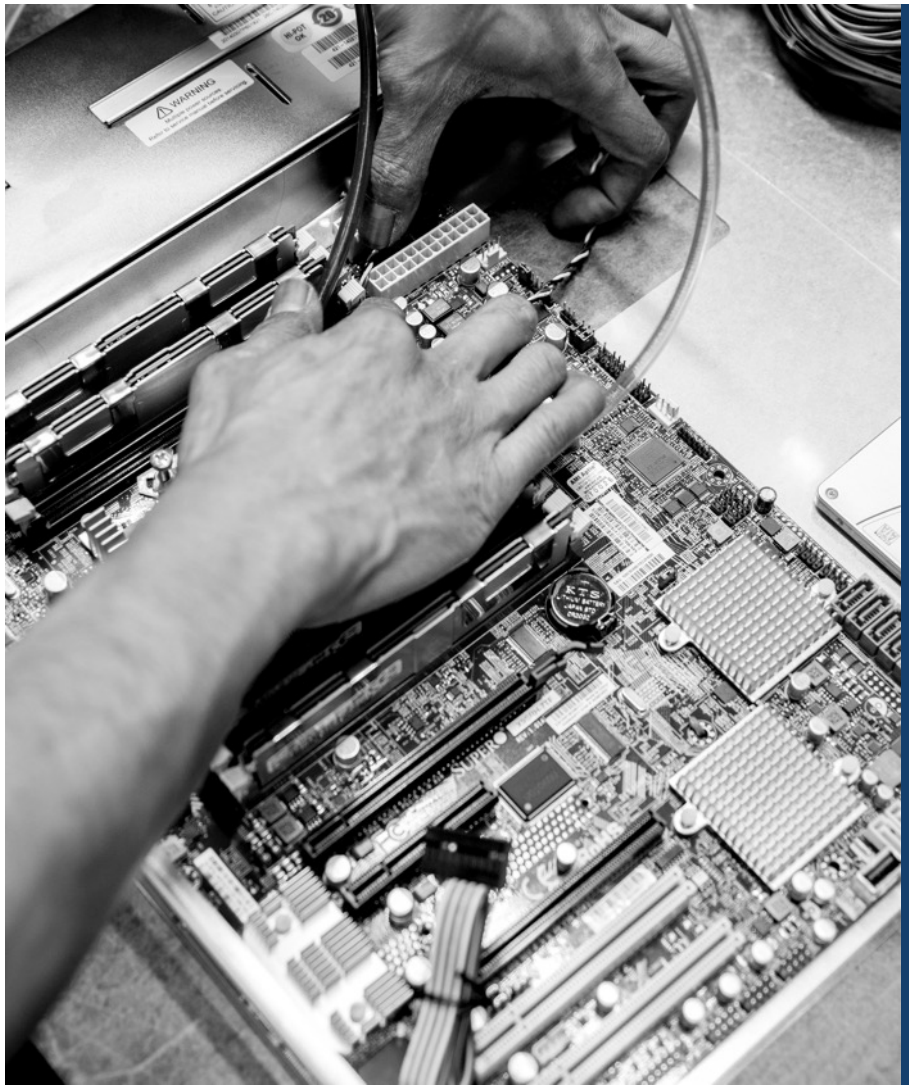

Constructor
of its own servers
since 2002

+500

servers/day

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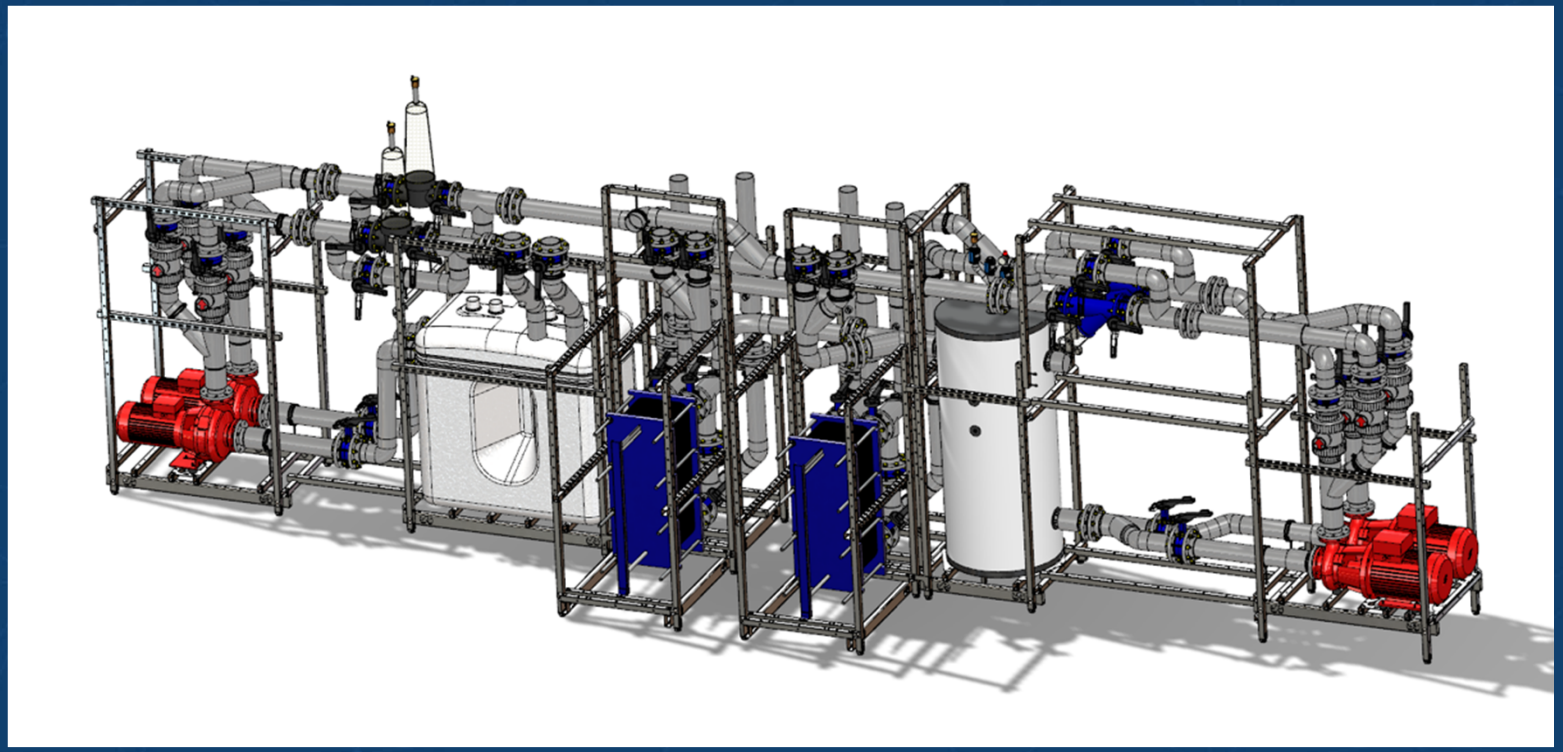
R&D Wind

Generators

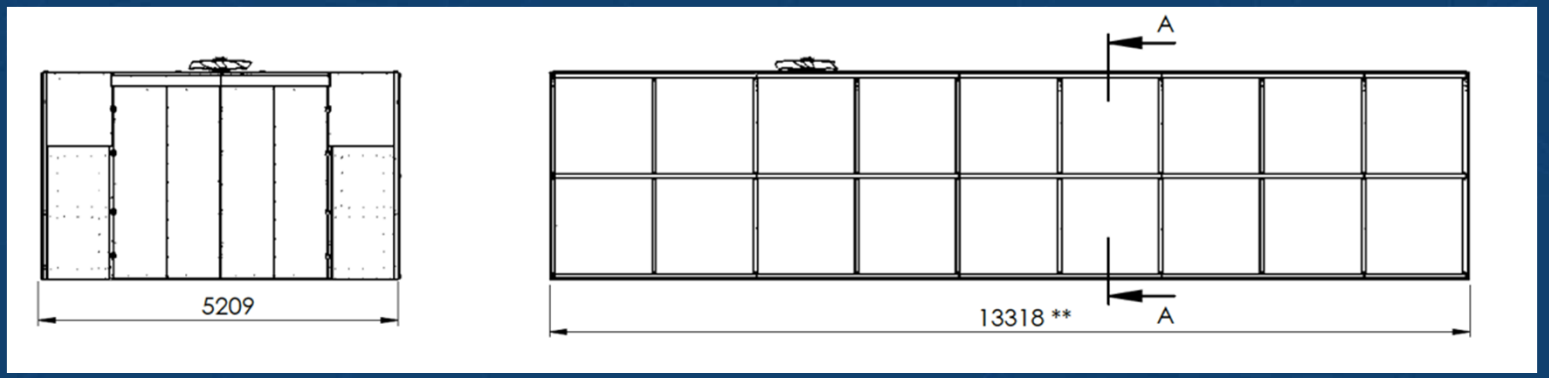
15 M €

invested in reusable energy

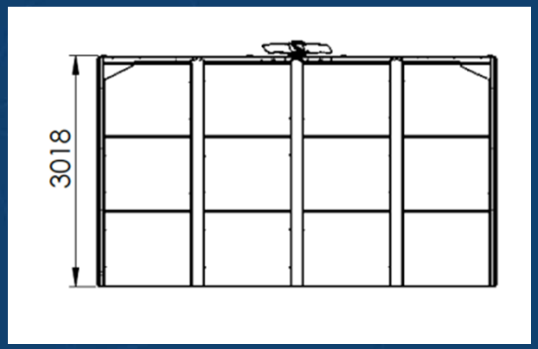
Watercooling 3D Model

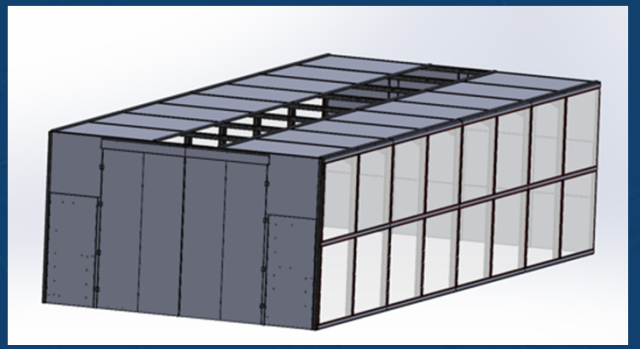


OVH Made-up Containers – 3 dimensions



- 11m
- 12m
- 13m





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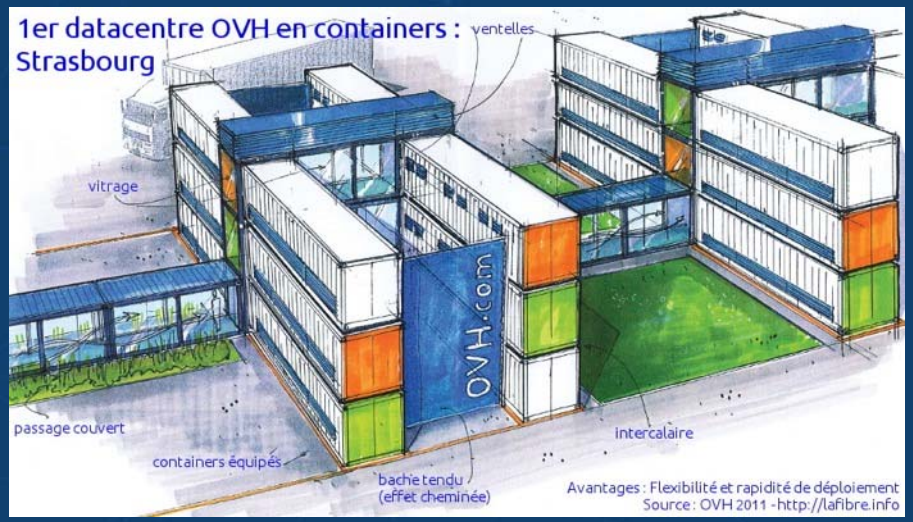
Building made of Shipping Containers



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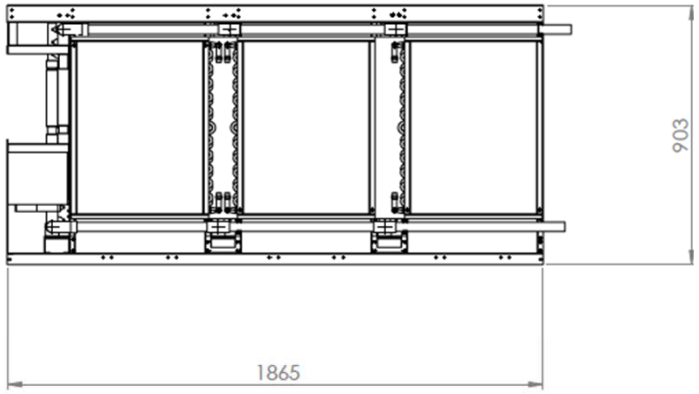
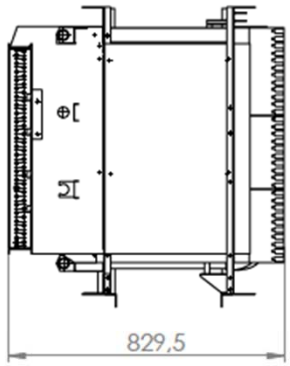
OVH Made-up Racks – Hori

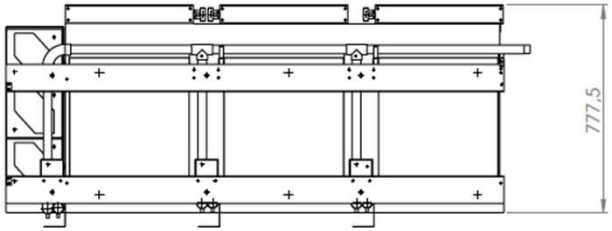
Vue de face

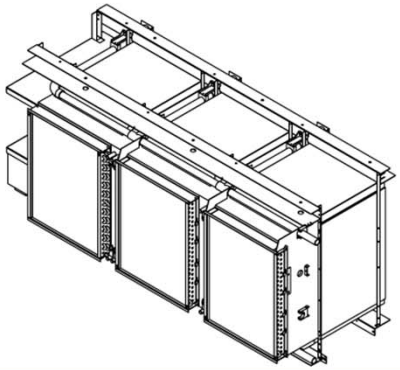


Vue decôté



Vue de dessus





PART 3

Energy Efficient Datacenters

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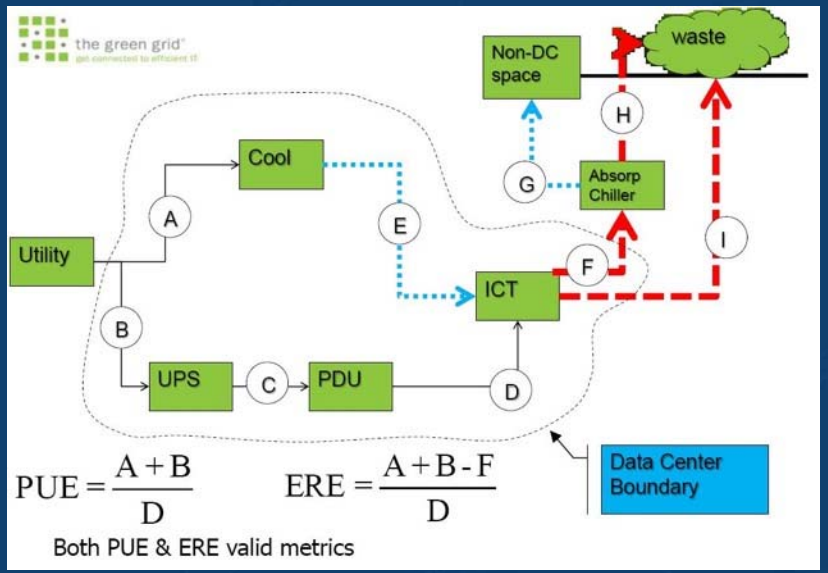
Power Usage Effectiveness (PUE)

Professors Robert Kaplan and David Norton once said: **“If you can’t measure it, you can’t manage it.”** Power Usage Effectiveness (PUE)

Three main indicators are now used in the data center

- The PUE - ratio of the power consumed by the datacenter to that delivered to the IT equipment
- The Energy Reuse Effectivness (ERE) - to take into account, independently of the CPUE, energy recovery efforts
- The Data Center Compute Efficiency (DCcE) to judge the actual activity of computer machines - and thus reduce server underutilization. Overall, the concepts of CPUE and ERE can be summarized as follows:



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The Standards

Four organizations make recommendations in the area of datacenters:

- The UPTIME INSTITUTE on the notions of reliability
- GREEN GRID on the notions of energy performance
- ASHRAE - American Society of Heating, Refrigeration, and Air conditioning Engineers; on environmental conditions eligible for IT equipment
- TIA and its TIA 942 standard - which sets out a number of principles, including the cabling of IT equipment and general datacenter layout.

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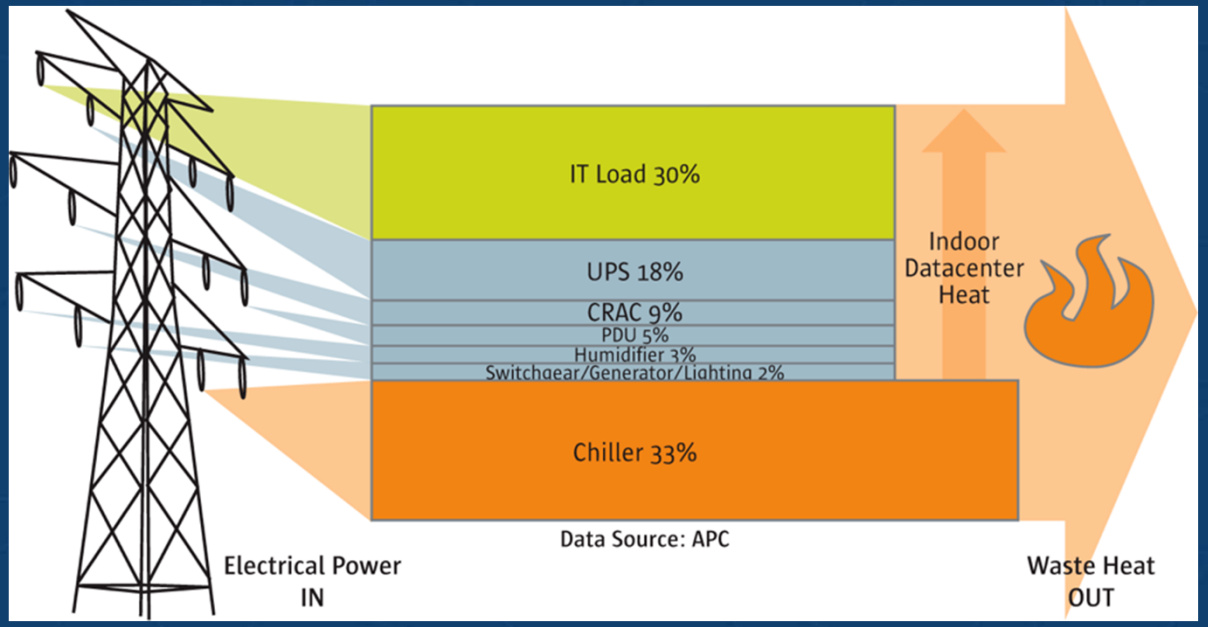
Datacenter Power Usage



Only a fraction of incoming power is delivered to the IT equipment in a datacenter, underscoring the need for both servers and infrastructure efficiency improvements.

Source: American Power Conversion

Datacenter Thermal Considerations

ASHRAE guidelines

Classes (a)	Equipment Environmental Specifications							
	Product Operations (b)(c)					Product Power Off (c) (d)		
	Dry-Bulb Temperature (˚C) (e) (g)	Humidity Range, non-Condensing (h) (i)	Maximum Dew Point (˚C)	Maximum Elevation (m)	Maximum Rate of Change(˚C/hr) (f)	Dry-Bulb Temperature (˚C)	Relative Humidity (%)	Maximum Dew Point (˚C)
Recommended (Applies to all A classes; individual data centers can choose to expand this range based upon the analysis described in the ASHRAE paper)								
A1 to A4	18 to 27	5.5ºC DP to 60% RH and 15ºC DP						
Allowable								
A1	15 to 32	20% to 80% RH	17	3050	5/20	5 to 45	8 to 80	27
A2	10 to 35	20% to 80% RH	21	3050	5/20	5 to 45	8 to 80	27
A3	5 to 40	-12˚C DP & 8% RH to 85% RH	24	3050	5/20	5 to 45	8 to 85	27
A4	5 to 45	-12˚C DP & 8% RH to 90% RH	24	3050	5/20	5 to 45	8 to 90	27
B	5 to 35	8% RH to 80% RH	28	3050	NA	5 to 45	8 to 80	29
C	5 to 40	8% RH to 80% RH	28	3050	NA	5 to 45	8 to 80	29

ASHRAE 2011 updated temperature and humidity ranges for datacenters - (ASHRAE Technical Committee 9.9, 2011)

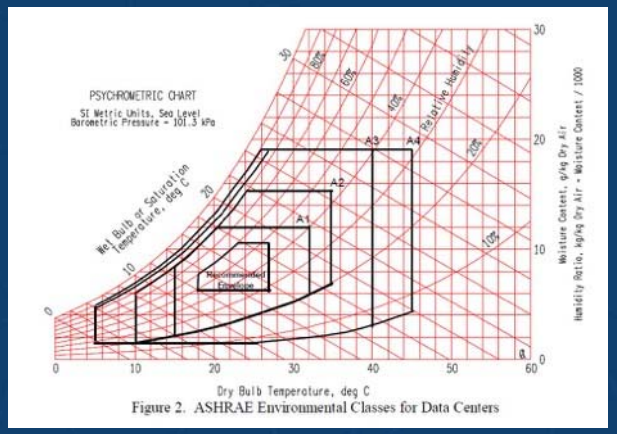


Figure 2. ASHRAE Environmental Classes for Data Centers

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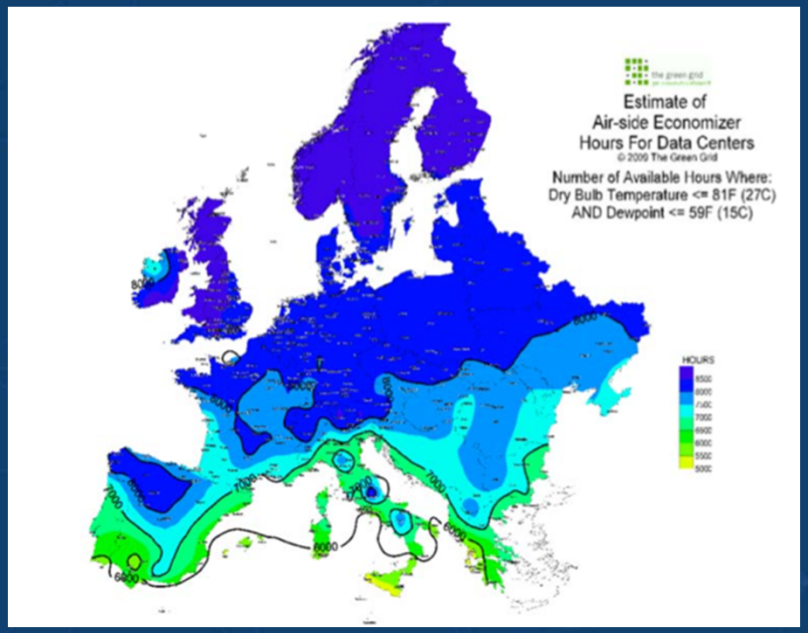
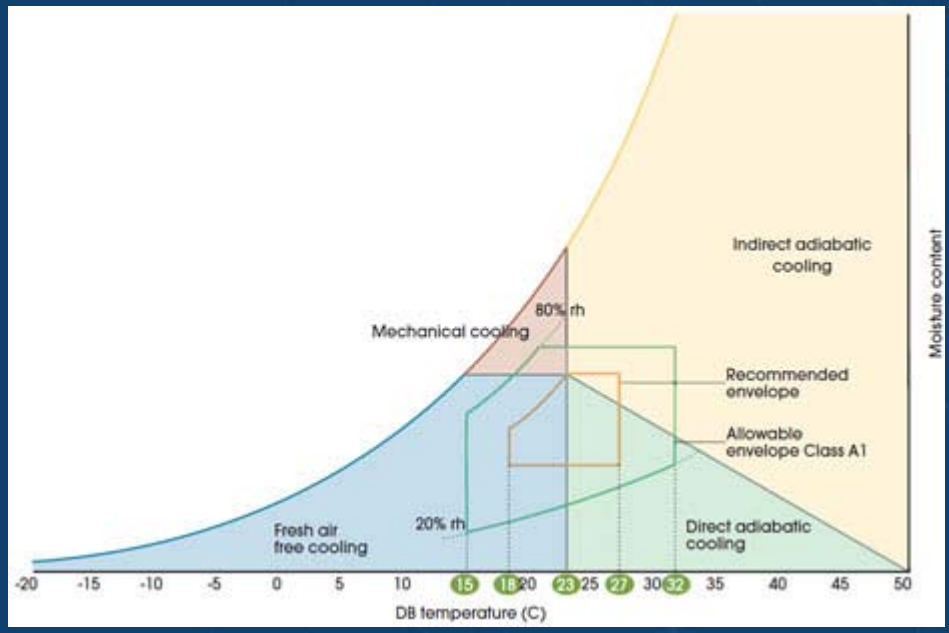
Datacenter Thermal Considerations

ASHRAE guidelines





Free cooling options to meet the required environmental envelope

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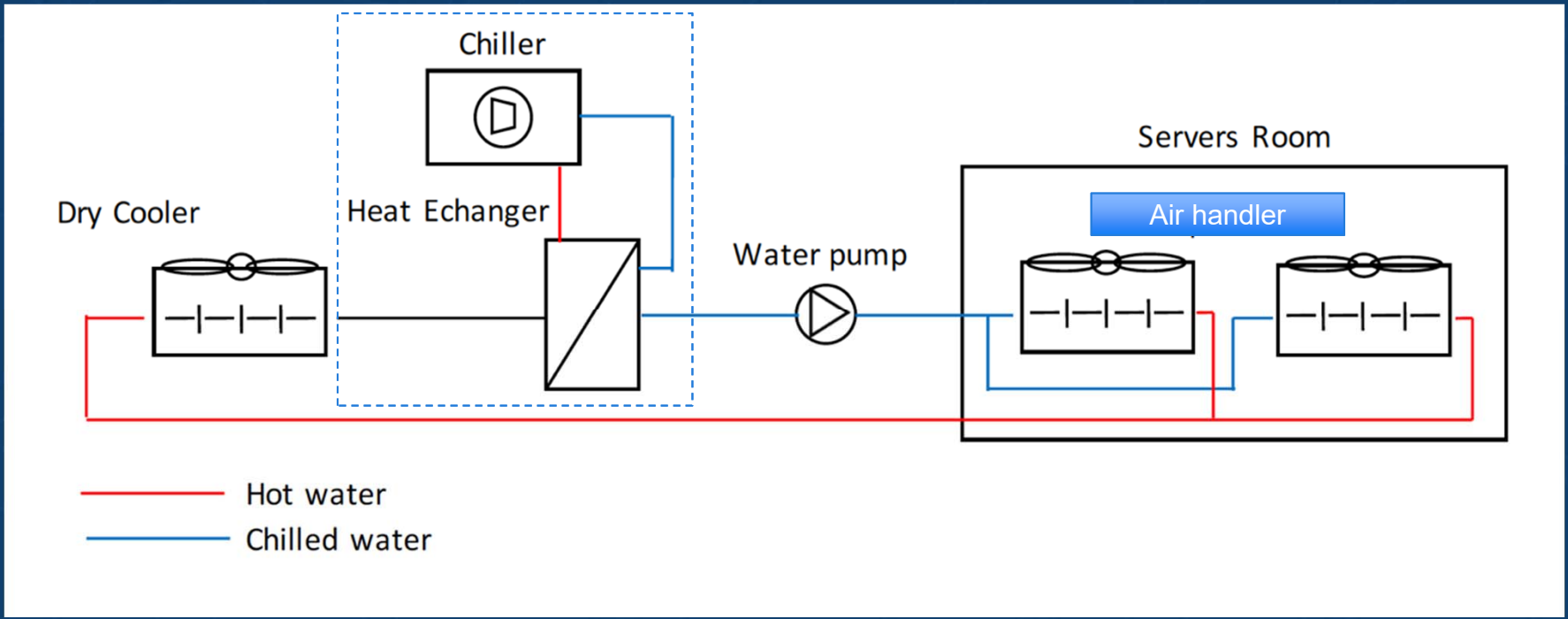
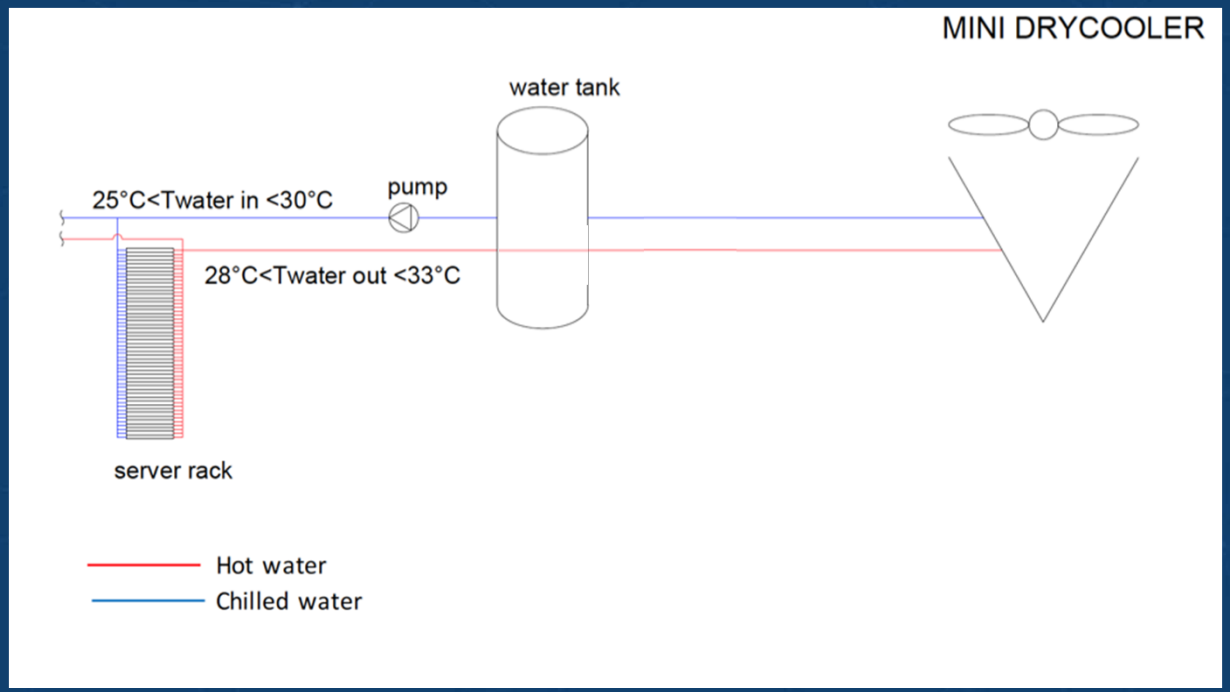
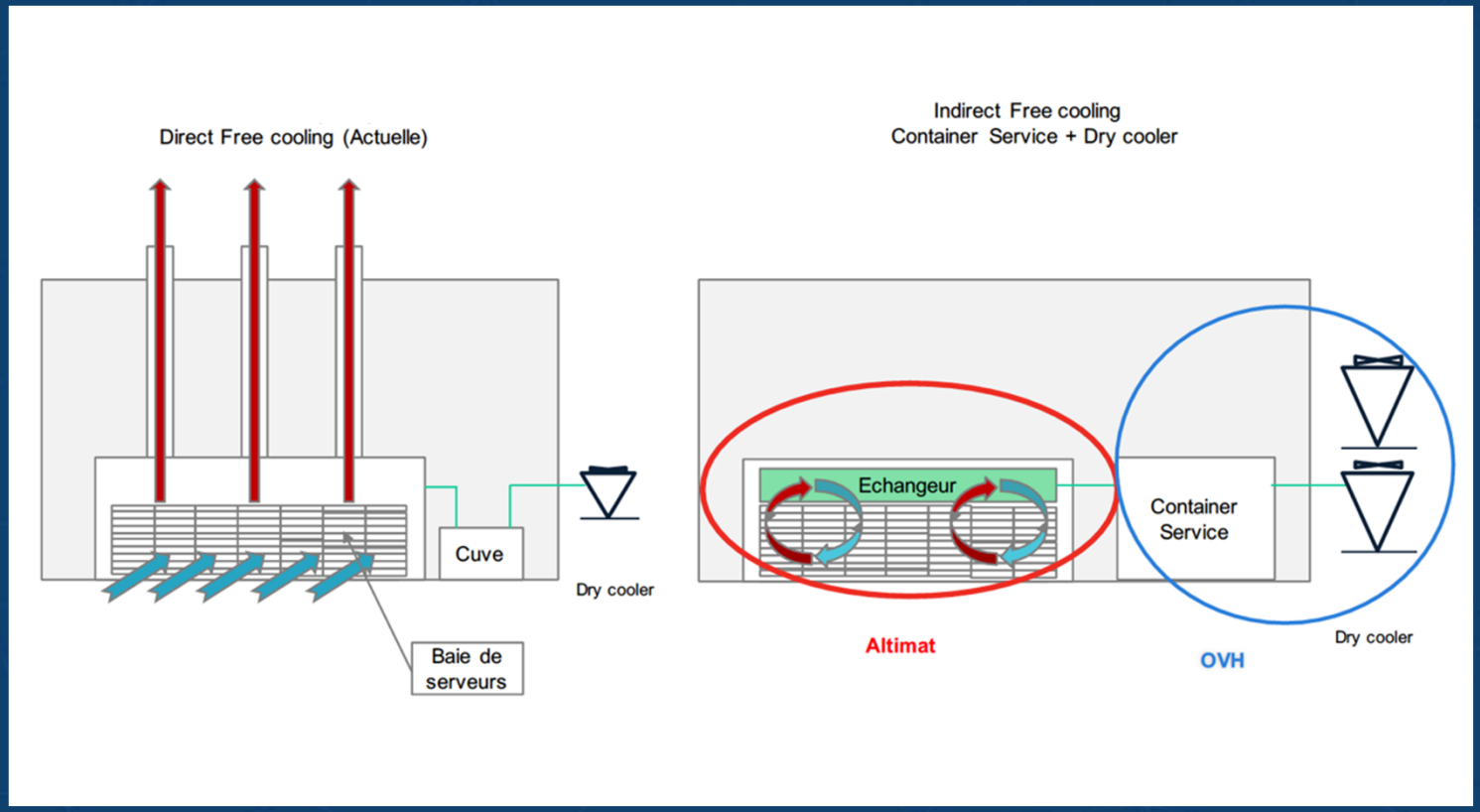
Air Cooling System - Dry Cooler block Diagram



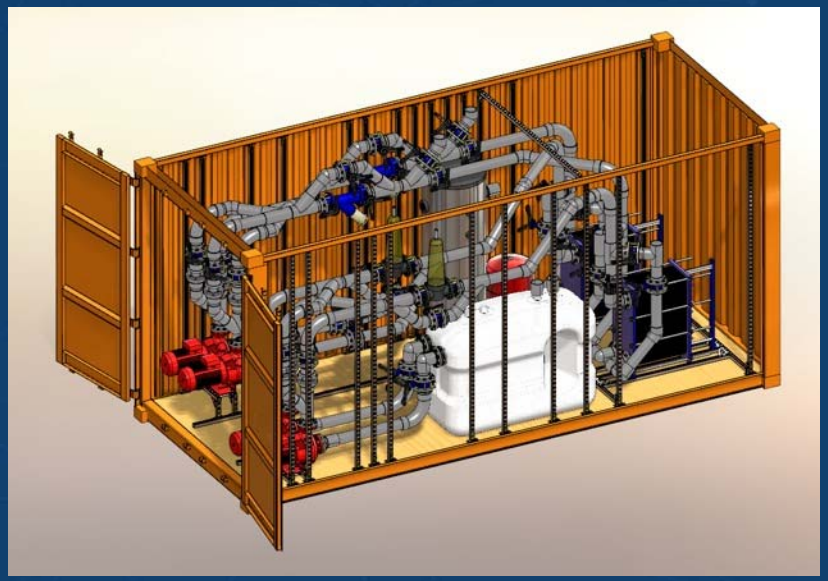
Water Cooling System - Dry Cooler block Diagram

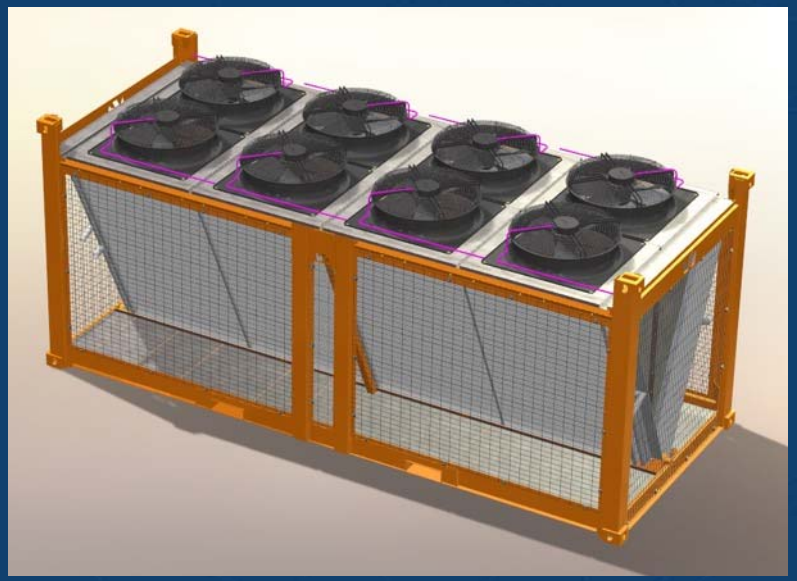


Air Cooling System - Dry Cooler block Diagram



OVH Watercooling container solution





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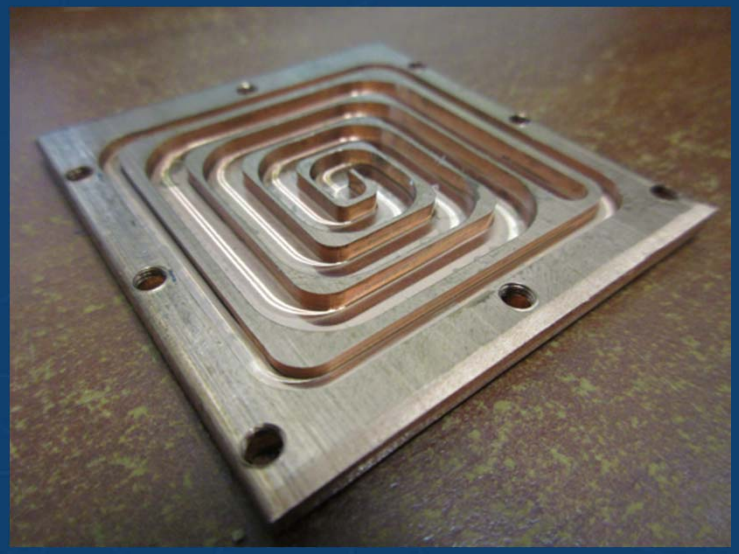
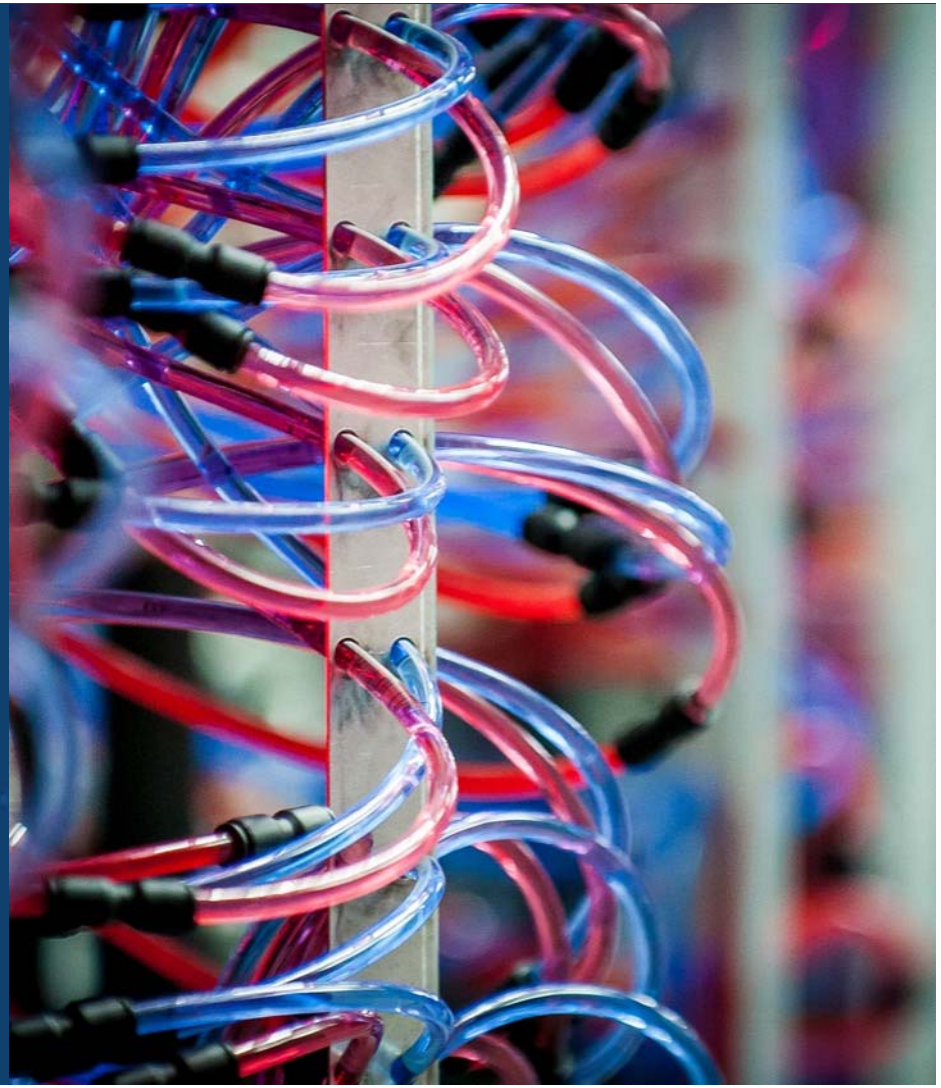
OVH Watercooling



Copper base 50x50, spiral 4x2mm, thk 3mm



PART 4

OVH Smart Datacenter

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Roubaix 4

1st

Datacenter without air-conditioning

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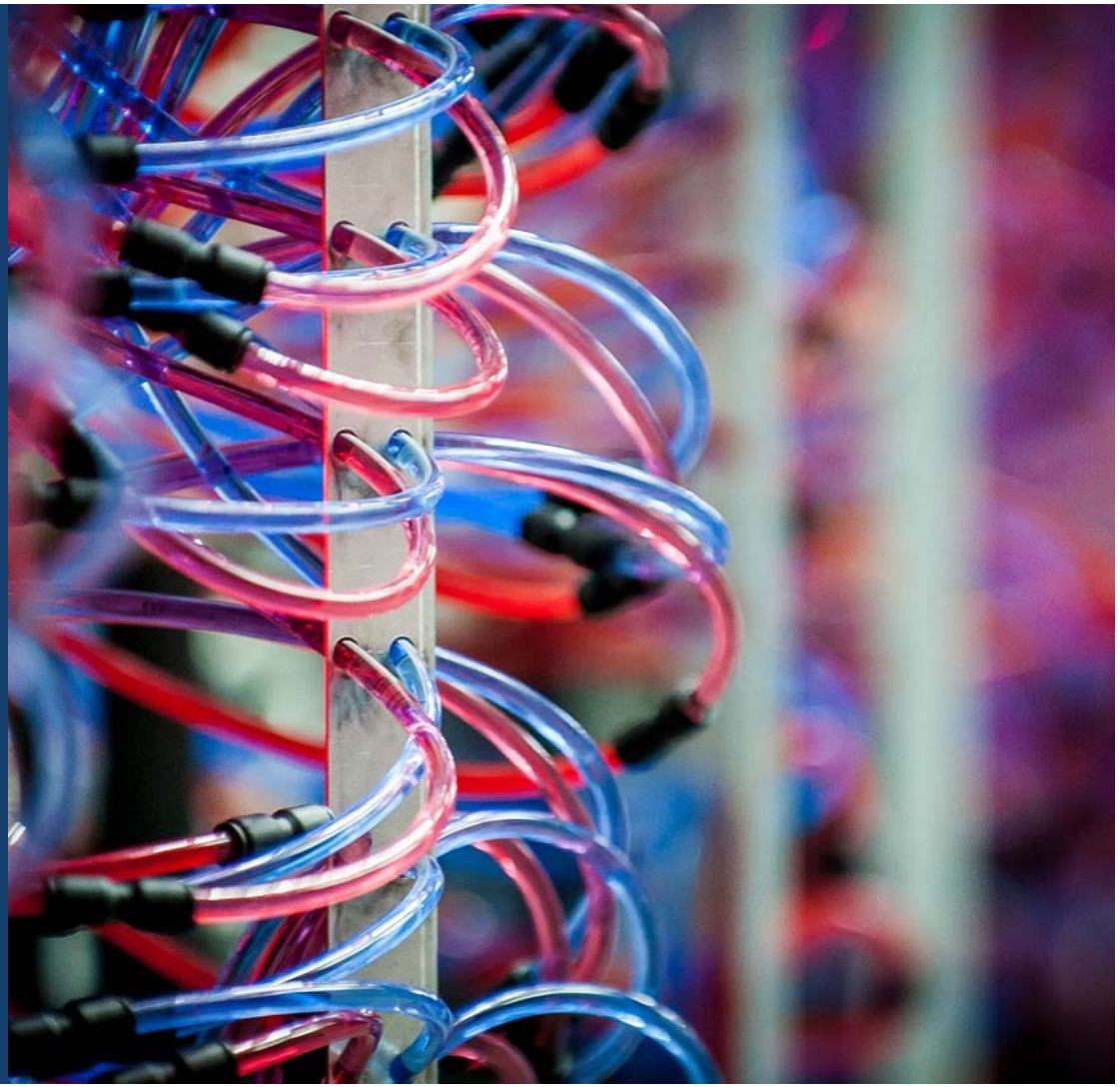
Watercooling + Aircooling

- **PUE 1.09**
- Less than 10W to cool a 100W server



Strasbourg

1st

Datacenter
in containers

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Beauharnois (BHS)

- Northern and Southern American market
- 4 datacenters
- Total capacity: 360,000 servers

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Beauharnois (BHS)

Gravelines (GRA)

- Northern European market
- 1 datacenter
- Total capacity: 400,000 servers

Gravelines (GRA)

The site has a double advantage, the proximity of the nuclear power plant and the seawater intake channel intended for the power station. The electrical supply is garanteed and also the cooling water supply.

Roubaix (RBX)

- Western and Northern European market
- 6 datacenters
- Total capacity: 400,000 servers

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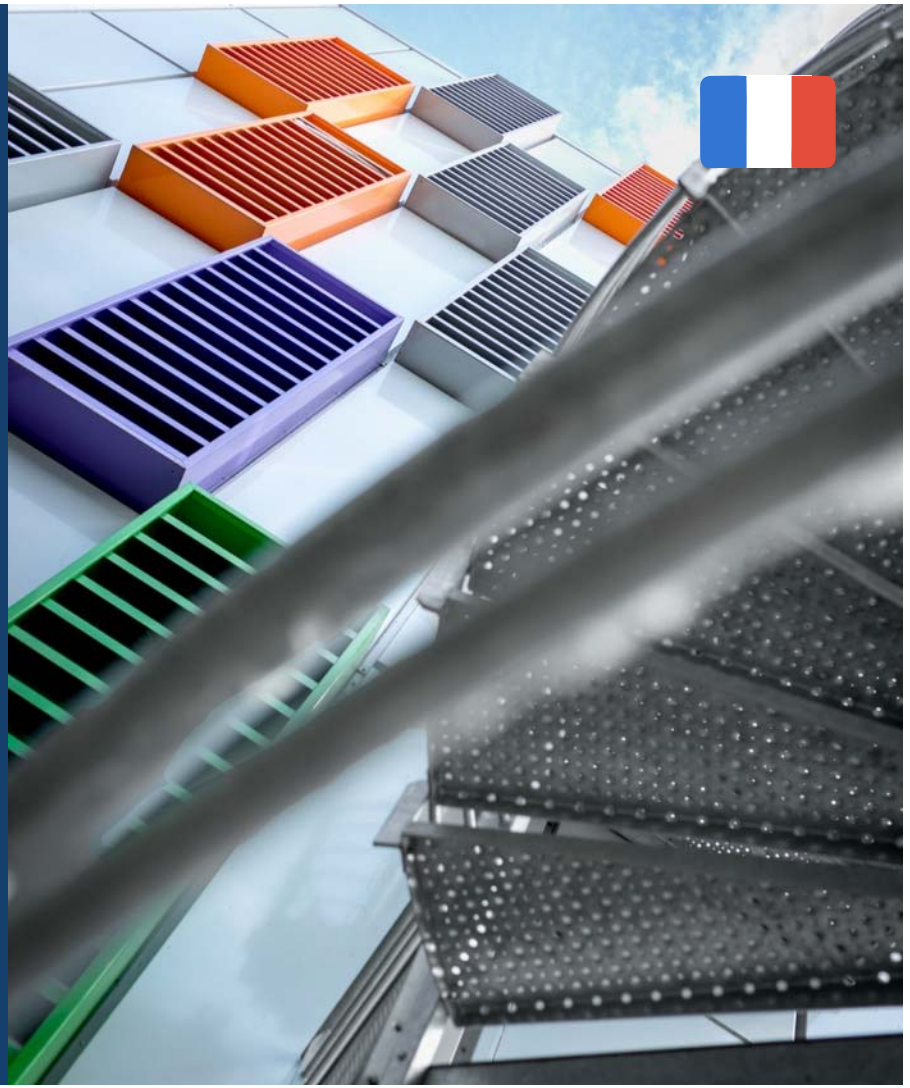
Strasbourg (SBG)

- Eastern European market
- 1 datacenter
- Total capacity: 400,000 servers



Paris (DC1-P19-GSW)

- European market
- 3 datacenters
- Total capacity:
  18,500 servers

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Thank you

Madrid

Thursday, 4th May 2017