

2CRSi Immersion Cooling Technology



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Why you should adopt immersion cooling

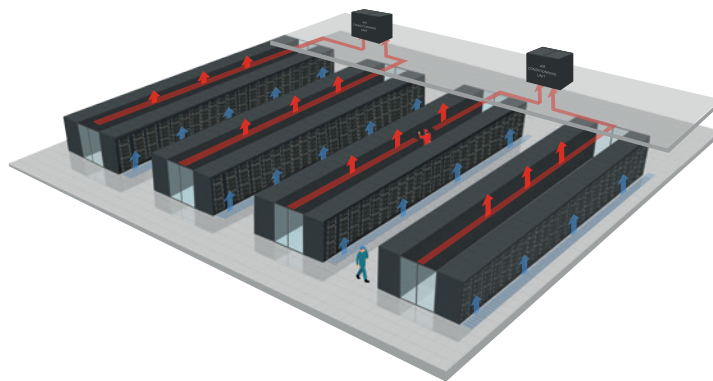
How do data centers manage fatal heat and power usage effectiveness issues today?

For as long as computing has taken place, there has been the debate about how to efficiently and safely cool systems and data centers.

Today, data centers account for about 4% of the world's energy consumption and could represent up to 10% in the coming years. In Europe, according to the European Commission (EC), the energy consumption of data centers in 2013 represented 56 billion kW/h . The EC estimates that this number reaches 104 billion kW/h in 2020.

Data centers are specific buildings containing a large quantity of computers, servers, storage racks, network and telecommunications equipments producing a critical amount of heat. Constantly cooling these infrastructures to keep them at a stable temperature requires a lot of energy.

“today, the chillers used to cool conventional data centers represent between 35% and 40% of the data center’s electricity consumption ”



*Traditional data center hot and cold aisle rack/cabinet configuration/layout.
Arrows show flow of hot and cold air. Cold air enters from raised floor.
Hot air is drawn into air conditioners.*

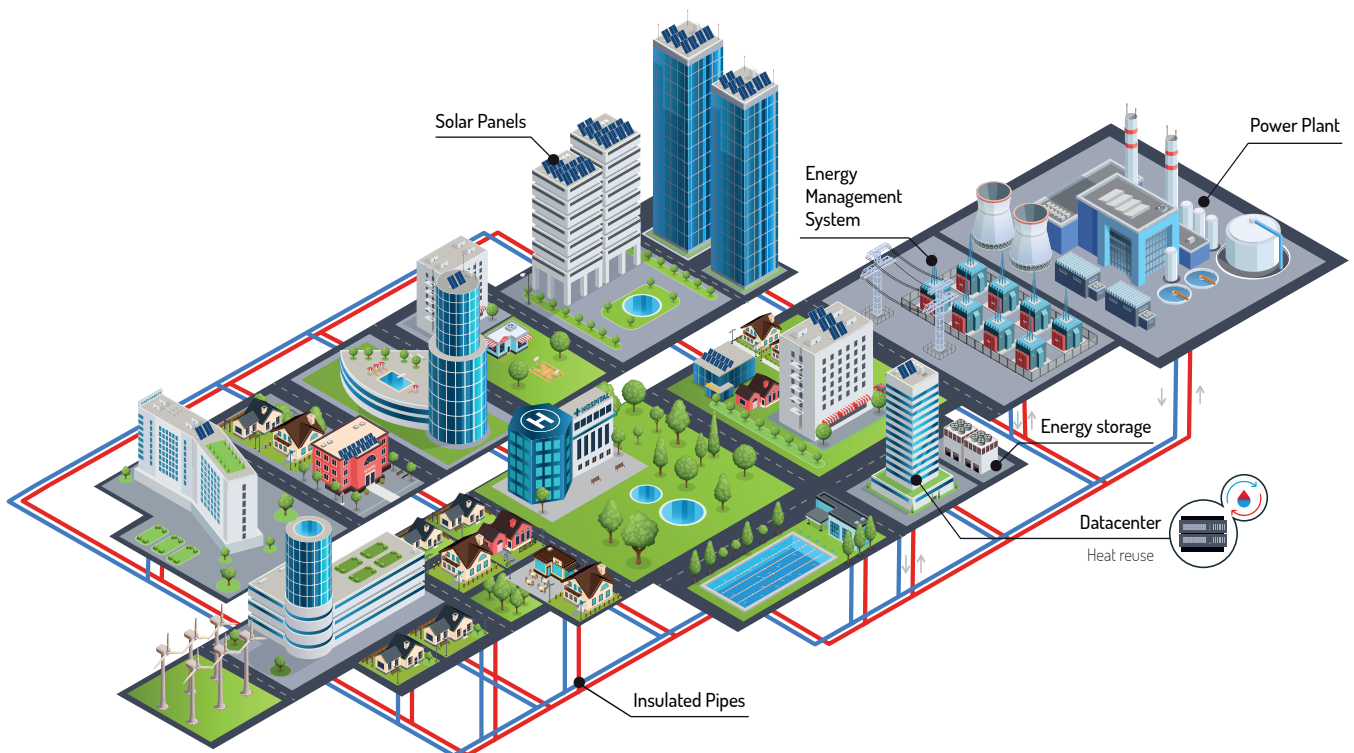
A way to concile IT with the planet

Immersion cooling is a key component in designing Smart Cities. Indeed, this cooling technology makes it possible to reuse the fatal heat generated by servers through the water network.

As shown below, this hot water might be used as a heating source (for domestic or business applications).

The ecological footprint is therefore improved thanks to a reduction of nearly 45% in carbon emissions compared to traditional air-cooled data center.

REUSE OF DATA CENTER HEAT



A way to achieve and exceed your goals

It's time to rethink your data center infrastructure by adopting our immersion cooling technology. As a leader, 2CRSi provides a cost effective and

environmentally friendly alternative that will allow you to exceed your economic and ecological goals.

How does immersion cooling work?

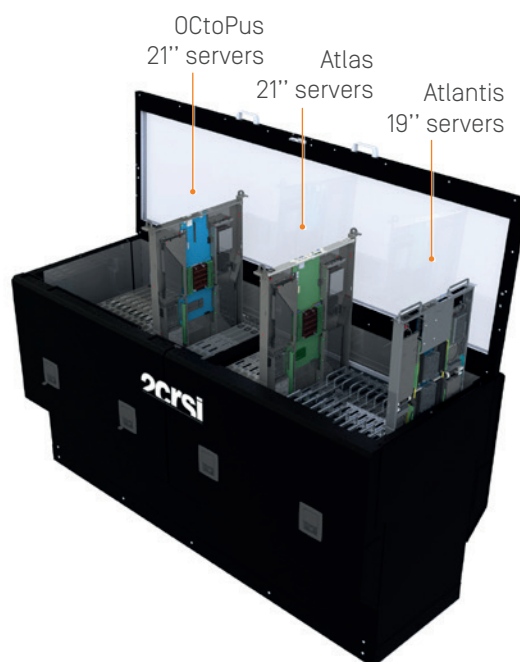
Design principles of total immersion

The immersion cooling technology consists in completely immersing a prepared computer server into a dielectric liquid*.

Through this process, all the heat generated via the hardware is absorbed by the liquid. This dielectric fluid is able to **capture 1500 times more heat** than air [same volumes and temperature].

The chosen liquid has a boiling point which is above 150°C and a high stability to prevent any risk of evaporation, overpressure or flammability. At 2CRSi, we use a biodegradable and environmentally friendly synthetic oil, which is our choice to **maximize thermal properties, stability, flow and ensure non-toxicity**.

**meaning it does not conduct electricity*



THE OctoTank XL WITH 3 RANGES
OF SERVERS BY 2CRSi
[OctoPus, Atlas and Atlantis]

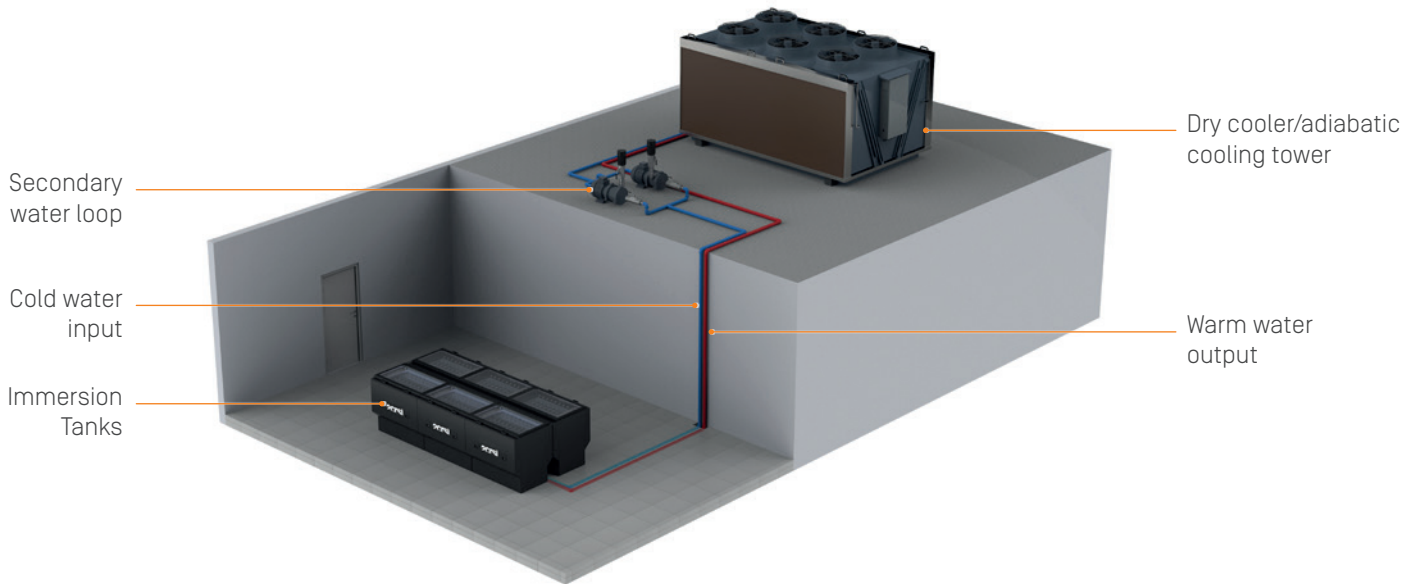
Simple and efficient

In our single-phase immersion tanks, the heat captured by the liquid from the servers is transferred via a heat exchanger to a secondary water system.

A pump ensures the circulation of the liquid to maximize the heat exchange.

With immersion cooling, fans are removed or deactivated (since they are not required for immersion technology), resulting in a reduction of energy consumption.

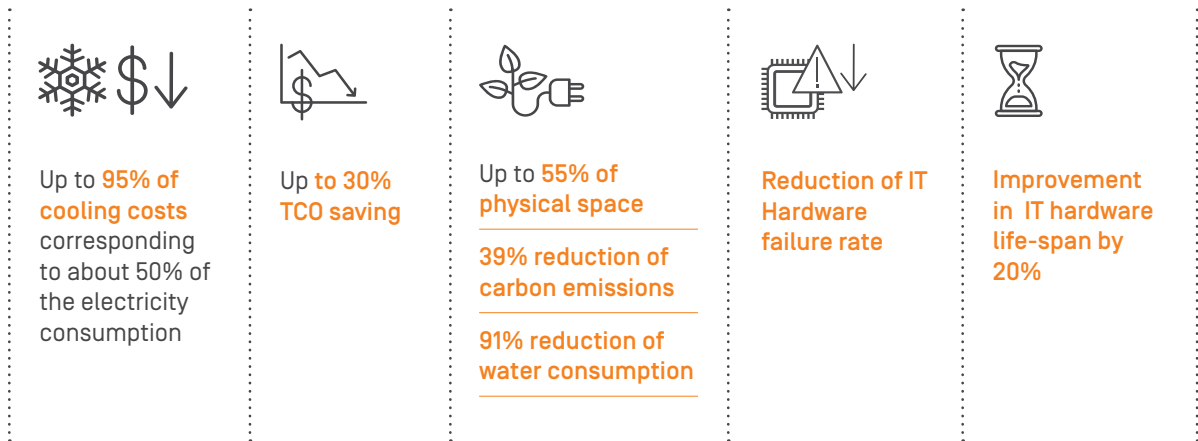
The heat captured by the water network can be either evacuated into the air by a dry cooler or reused for heating or domestic water.



IMMERSION COOLING
INFRASTRUCTURE EXAMPLE

Key Benefits of Data center cooled by immersion

Unrivalled Total Cost of Ownership (TCO) compared to a traditional data center:



Meeting sustainable and ergonomic needs

The lifetime of immersed components is higher than with an traditional air-cooled solution. a reduced failure rate allows to dramatically reduce replacement costs. Also, thanks to the temperature homogeneity ensured by the dielectric fluid, components are not stressed by sudden temperature changes.

In a conventional air-cooled data center, ambient noise can exceed 90 decibels, leading to poor difficult working conditions... As immersion cooling functions without fans, noise pollution is avoided, contributing to ideal working conditions.



Homogeneous cooling

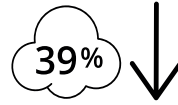


Noiseless

Carbon Neutrality

Our 2CRSi immersion cooling technology results in an annual carbon emissions reduction of over 10 000 tons per year **-39%** [*] while providing similar capacity than a traditional DC. Water consumption can also be reduced by up to **-91%** [*] thanks to immersion.

**Comparison tables of carbon emissions and water consumption between two data centers (traditional IT and immersion IT) can be found in the annex.*



Reduction of the carbon emissions by 39%



Reduction of the water consumption by 91%

Cool down your investment

Our IT cost effective response to your needs:

-40% OPEX

Data center with Immersion Cooling Technology can reduce power consumption operating costs by **up to 40%** [*].

-30% CAPEX

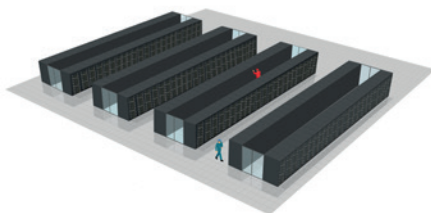
Traditional data centers require very complex air cooling systems. With the Immersion Cooling Technology, there is no need for the installation of refrigerated cabinets, false raised floors, corridors etc. As a result, CAPEX can be reduced by **up to 30%**.

OPTIMIZED FLOOR SPACE

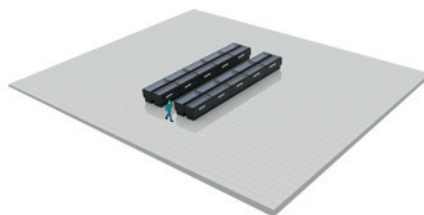
By eliminating essential equipment required for traditional air cooled data centers, immersion cooling makes it possible to optimize floor space usage. Our technology allows for high density performance for the same number of servers per m² (see below).

**(Estimation, based on use cases)*

Floor space and electricity consumption comparison between air-cooling and immersion



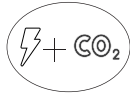
1000 M²:
200 Traditional racks
Rack power: 5 kW on a total of 1MW Data center



30 M²:
10 OctoTank XL
Tank power: 50 kW on a total of 1MW Data center
Notice: Dedicated ACU is no longer required.

To go deeper

Comparison of the carbon footprint of two Data centers



In our more and more digitalized world, carbon emissions are mainly driven by the extraction of raw materials and their transformation into electronic components, as well as by electricity production of electricity.

In FRANCE: 1 kWh of electricity = 0.104 kg of CO²

(green production due to nuclear plants)

In USA: 1 kWh of electricity = 454g of CO²

CUE

Carbon usage effectiveness (CUE) is a metric that determines the carbon gas emitted by a data center on a daily basis. This metric was developed by the non-profit consortium, The Green Grid.

It is calculated by dividing the total carbon dioxide emissions equivalents (CO²) of the facility's energy consumption by the total IT energy consumption.

	Data center A Air Cooling Efficient and traditional IT	Data center B Immersion Cooling
Computing capacity	12 000 servers	
Server Power average	350 W	280 W*
IT power	4.2 MW	3.36 MW
Cooling Overhead	30%	2%
Electrical Overhead	6%	1%
Effective PUE (Power Usage Effectiveness)	1.36	1.03
Total Facility Power	5.7 MW	3.5 MW
Energy Consumption per year	50 Million kWh	30.3 Million kWh
USA Carbon emission per year	22.7 Million kgCO²	13.8 Million kgCO²
FRANCE Carbon emission per year	5.2 Million kgCO²	3.2 Million kgCO²
USA Effective CUE	0.62 kg CO ² /Kwh	0.47 kg CO ² /Kwh
FRANCE Effective CUE	0.14 kg CO ² /Kwh	0.12 kg CO ² /Kwh

* Consumption reduction due to fans removal



Reduction of the carbon emissions by up to 39% thanks to immersion

Comparison of the water consumption of two Data centers

To reduce water consumption in data centers, a measuring OR measurement system called WUE (Water Use Efficiency) allows measuring water and energy consumption in data centers. WUE is calculated by dividing annual water usage made by the data center (in liters) by IT equipment energy consumption (kilowatts per hour or kWh).



	Data center A	Data center B
	Air Cooling Efficient and traditional IT	Immersion Cooling
Total Facility Power	5.7 MW	3.5 MW
Daily site water usage	507 300 L	43 750 L
Energy source water per year	94.07 Million L	57 Million L
Site Water Usage per year	185.16 Million L	15.97 Million L
Site WUE	7.59 L/kWh	2.48 L/kWh



Reduction of the water consumption by up to 91% thanks to immersion cooling solution



2CRSi immersion cooling technology solutions

2CRSi immersed servers range

Wide range of servers to optimize your IT

At 2CRSi, we design and manufacture 3 immersion server ranges based on customer insights. Our solutions answer different needs, ranging from generic platforms to high density compute & GPU compute applications, and are conceived to deliver an optimal performance in conjunction with immersion cooling.

The OCtoPus, the latest generation of 21" servers engineered by 2CRSi, the Atlantis (19") and the Atlas (21") are specifically designed to be immersed in tanks.

We are not only building tailor-made immersion servers, **we can also adapt your current existing servers to our immersion technology.**

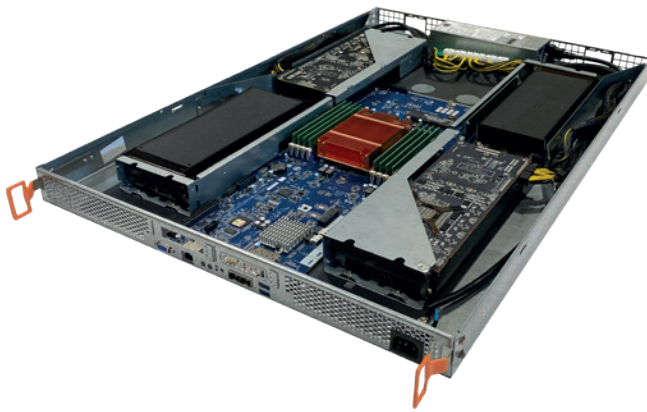
OctoPus



21" servers 1 OpenU or multi OpenU

- Based on OCP technology
- Best profitability
- Stronger performance
- Higher flexibility
- Improved MTBF
- Easy handling

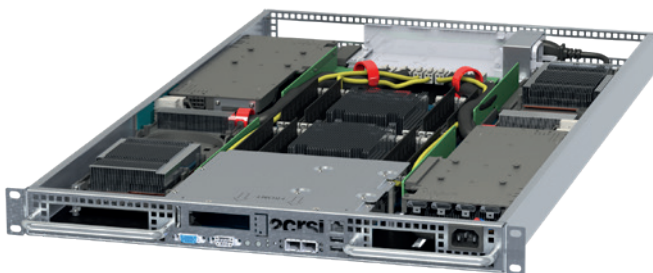
Atlas



21" servers 1 OpenU or multi OpenU

- Best TCO
- High density
- Stronger Performance
- Best TCO for small installations

Atlantis



Standard 19" servers 1 U or multi U

- Best profitability
- Stronger performance
- Higher flexibility

Server range

Servers with multi graphic cards

One node and two GPUs	OCtoPus 1.2	Atlas 1.2	Atlantis 1.2
One node and four GPUs	OCtoPus 1.4	Atlas 1.4	Atlantis 1.4
One node and eight GPUs	OCtoPus 1.8	Atlas 1.8	Atlantis 1.8

Servers with dual-CPU with 2-slot GPU

Two nodes each with two GPUs	OCtoPus 2.2	Atlas 2.2	Atlantis 2.2
Two nodes each with one CPU and four GPUs	OCtoPus 2.4		

Servers with multiple single CPU nodes

Three nodes	OCtoPus 3
Three nodes and multiple storage capacities	OCtoPus 3
Four nodes	OCtoPus 4
Five nodes	OCtoPus 5
Eight nodes	OCtoPus 8

More about 2CRSi OctoTanks

In 2018, after months of development and based on customer insights from various industries (Oil & Gas, Banking, European Security), 2CRSi came up with a solution capable of transposing air cooled servers to immersion cooled servers.

Our objective was to deliver a solution that could allow for IT densification, components failure reduction and life cycle increase, whilst ensuring financial savings. The next step was the tanks, that could take this vision to the next level.

The OctoTanks X & XL: immersion cooling made practical

The 2CRSi OctoTanks range [X / XL] has a cooling capacity of **50 kW**. This dissipation is made possible thanks to the CDU (Cooling Distribution Unit) exchangers, which are directly integrated in each tank.



OctoTank X

The OctoTank XL+ : unrivaled density

The XL+ has 2 CDUs for a total dissipation capacity of **100 kW** for 39 OpenU or 41 U.

The CDUs ensure the temperature exchange between the hot liquid and the cold water getting into the tanks. The CDUs are equipped with a **double pump**, ensuring the appropriate redundancy and creating a movement within the liquid to ensure uniform cooling within the whole equipment.



OctoTank XL+

OctoTank statement of line

	OctoTank X	OctoTank XL	OctoTank XL+
IT Hardware capacity	21U / 190U	44U / 420U	41U / 390U
Dimensions	120(L) x 93(W) x 121(H) cm	228(L) x 90(W) x 119(H) cm	228(L) x 90(W) x 119(H) cm
Weight [Empty]	411 kg / 905 lbs	671 kg / 1,476 lbs	766,95 kg / 1,690 lbs
SmartCoolant capacity	576 l / 152,2 gal	1 186 l / 313 gal	1 186 l / 313 gal
Total weight [Full of SmartCoolant]	872 kg / 1,922 lbs	1 691 kg / 3,728 lbs	1 787 kg / 3,940 lbs
Typical SmartCoolant/Temperature setpoint	40°C-60°C/104°F-140°F		

The CDU (Cooling Distribution Unit)

	OctoTank X	OctoTank XL	OctoTank XL+
Heat dissipation capacity	50 kW	50 kW	100 kW
Max power consumption	750 W	750 W	1 500 W
Mechanical Power Usage Effectiveness	1,015		
Redundancy	2N / Tier III	2N / Tier III	2N / Tier IV
Power supply	380-400V 50Hz / 208-230V 60Hz		
Power supply connection	Industrial connector three phase 3P+E +N 32A IEC60309 / plug L2120 20A NEMA		
Water supply connection	G 1 1/4" BSPP female , NPT male		
Monitoring	+ 20 real-time metrics over public REST API / DCIM compatible		

Deployment Requirements

	OctoTank X	OctoTank XL	OctoTank XL+
Water supply in let temperature	Recommended less or equal to 32°C / 89°F Inhibitors and/or softners: depending on Icing and Water quality conditions		
Water flow rate	9 to 11 m3/h		
Warm water outlet temperature	Expected 37°C / 99°F		
Floor load capacity	900 kg/sqm/ 1980 lbs (IT Hardware not considered)		
Fire Supression System	Standard air-cooled data center tire suppression system		
Temperature	-20°C to 55°C / -4°F to 131°F		

And to go even further: Meet **The Dry Zone**, our latest innovation

Our R&D developed an external extension called 'The Dry Zone'. This tank add-on allows installation of any switch or storage device outside of our

OctoTank, to keep them away from the dielectric fluid/liquid .



Forklift holes, easy mount

Advantages:

Keep your switches and storage devices away from liquid

Our Dry Zone keeps your devices running without any modification such as fan desactivation, firmware updates, etc.

Improve data cables management

The connection between the immersed IT infrastructure and switches is made at the front of the tank, allowing easier access and better cable management.

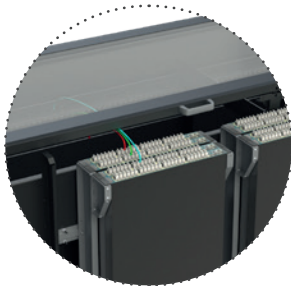
Increased profitability

The Dry Zone offers an additional 12 OpenU capacity to the OctoTank. Your TCO is reduced accordingly.

Easy mounting and removal of the add-on part

The mounting is made on existing screws and the whole Dry Zone structure can be easily moved with the OctoTank.

Easy cables access



Two possible versions



6 U for switches
[2 U x 3 switches]



12 U for switches
[2 U x 6 switches]

2CRSi immersion solutions statement of line

Specifications overview

	OCtoPus	Atlas	Atlantis
Format	21"	21"	19"
Number of servers per OctoTank X	16*	19	21
Number of servers per OctoTank XL	39*	42	44
Number of servers per OctoTank XL+	36*	39	41
PDB [OCP accepted]	Yes	-	-
Busbar [OCP accepted]	Yes	-	-
PSU [integrated in servers]	-	Yes	Yes
Power distribution from tank	No	Yes	Yes

*The OCP powershell can use 30U



About 2CRSi

Created in 2005, 2CRSi focuses on server design and manufacturing.

We provide suitable products for industries which require data centers looking for high-performance and high-density systems combined with energy efficiency.

Our products are designed and manufactured in France, the United Kingdom and San Jose, USA.

With subsidiaries in Manchester and Dubai, we deploy our products on a very large scale in 25 countries for computing, data storage and data transfer.

Research and Development

A strong R&D investment enables us to re-think and re-design next generation servers, from A to Z. Our in-house expertise allows us to develop electronic and mechanical features to answer our clients' unique needs.

Mechanics

Software Engineering

Electronics

Innovation

Thermodynamics

Strong partnerships

Our partners network encompasses well known actors, as well as smaller growing businesses. Working in close collaboration allows us to leverage any technology available on the market: from tried and tested equipment to disruptive technologies, we streamline and re-think the whole concept to perfectly match our clients' needs, in an energy efficient and affordable way.



Western Digital

AMD



Our value proposition

Green-IT

2CRSi has already been acknowledged by its peers for designing and engineering solutions that will lead the way to a greener future.

High performance

Our R&D works to optimize our solutions' density, compute power and network speed capabilities. We also improve our solutions' efficiency, flexibility and ease of use by following the Open Compute Project foundation.

Tailor-made

Your specific needs drive our technical approach: from our existing offer to new developments, we customize our servers according to your criteria

Smart Design

Our solutions are designed to be simple, flexible and scalable.

Operational agility

We allocate specific resources to your projects.

Involvement in the OCP community



2CRSi is proud to be platinum member of the OCP community. Open Compute Project is a movement launched in 2011 by Facebook to define new architecture optimized to break IT standards. It focuses on resources sharing, energy efficiency and complexity reduction.

2CRSi
DESIGNER AND MANUFACTURER
OF INNOVATIVE AND ENERGY-EFFICIENT
IT SOLUTIONS

Global Presence



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