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Mixed Environment, Hybrid, Edge Data Centres

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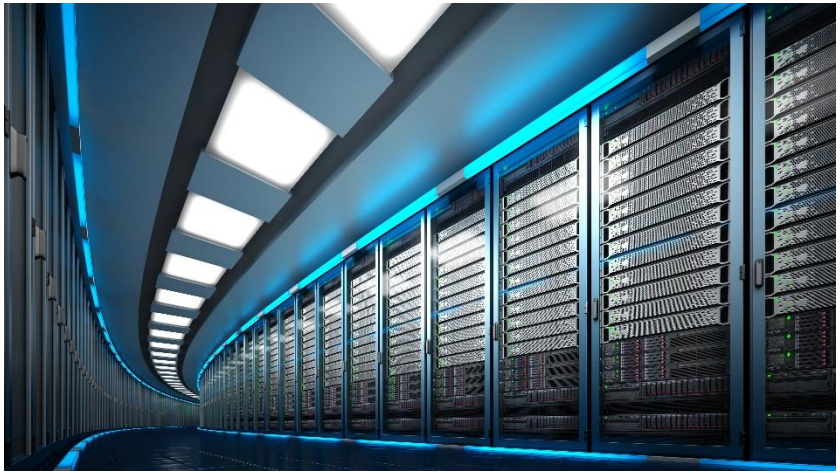
What is the data centre of the future?

- Capable of meeting demand of digital expansion to all areas of everyday life.
- Consumer driven: increasingly requiring high density, high performance compute.

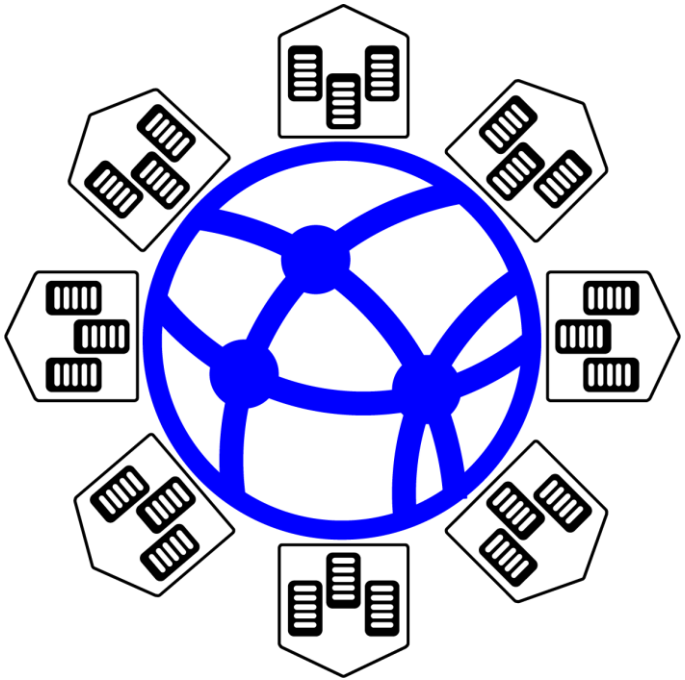
Scale




INDUSTRY
SECURITY
RETAIL
SOCIETY
HEALTHCARE
HOME
ENERGY
MOBILITY

Physical footprint

- Lots of racks.
- Lots of data centres.



Energy footprint

- In 2016, it was estimated that data centres used 3% of the global energy supply, with consumption expected to treble by mid-2020s.

Carbon footprint

- Data centre industry generates up to 2% of global CO_2 emissions = aviation industry (EU, 2017).

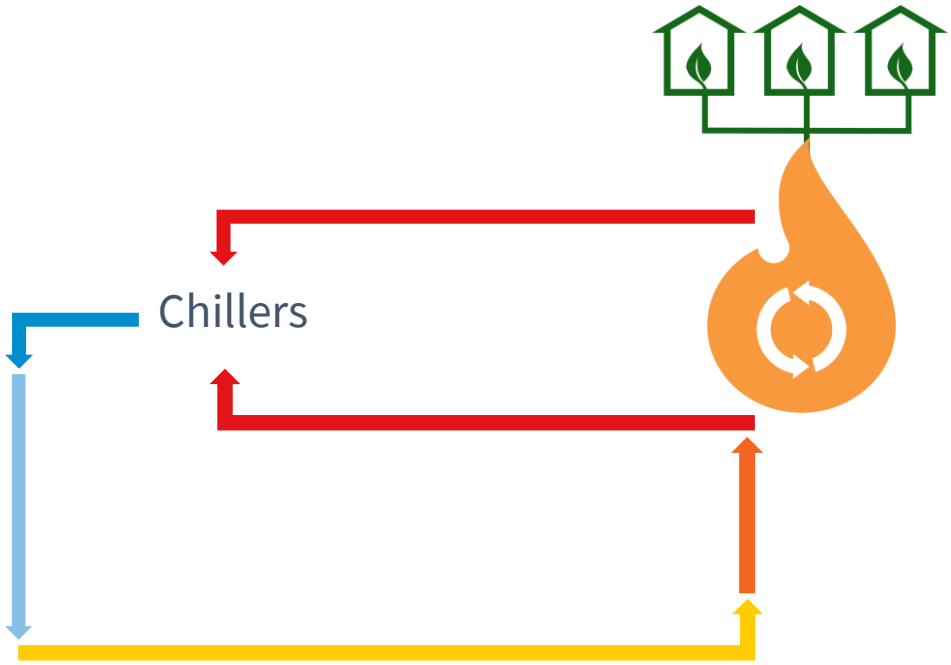
Considerations for build

- Location
- Power source
- Heat re-use potential
- IT equipment
- Appropriate cooling.

Modular approach

- All areas can be modularized.
- Build as required.
- IT requirement to drive the design.

Reconceptualising ‘waste’ heat



Immersion

Rear Door On-Chip

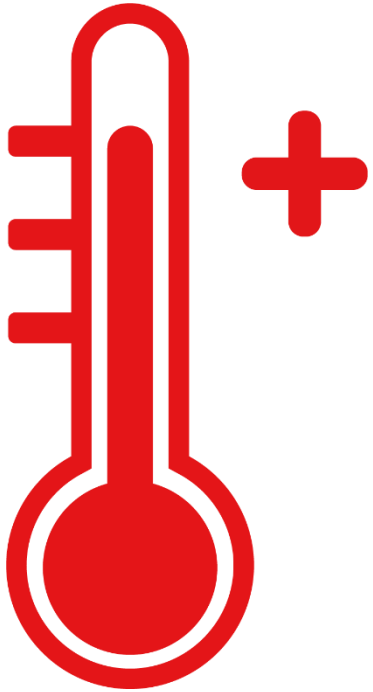
In-Rack In-Row HPC

Hot Aisle OCP

Hot Aisle

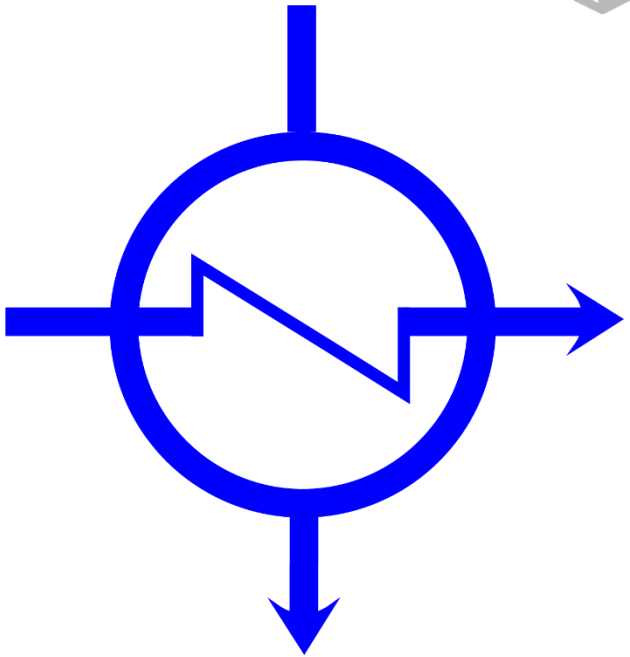
High grade heat

- Usable bi-product.
- Avoid wasting valuable resources.
- Once heat reaches 60°C it has a variety of uses.



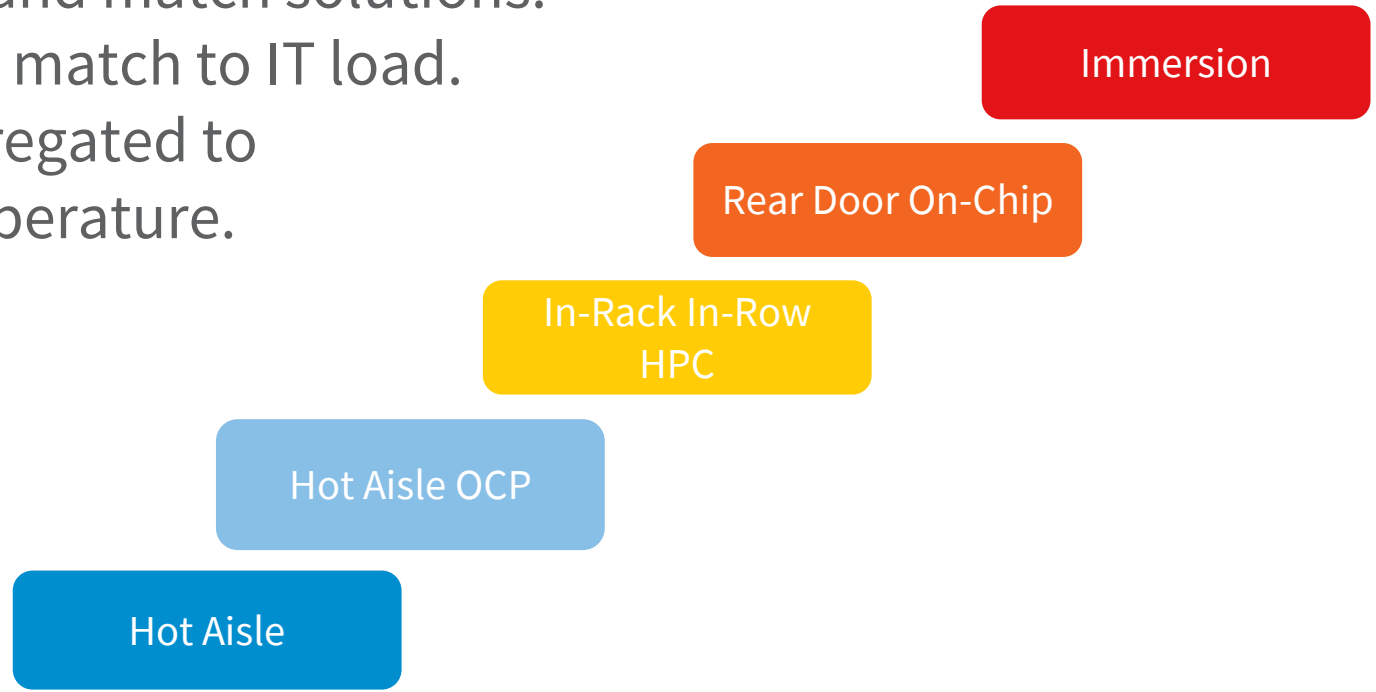
Heat exchangers

- Variable flow rates.
- Definable inlet and outlet temperatures.



Cooling Technologies 1

- Mix and match solutions.
- Best match to IT load.
- Aggregated to temperature.

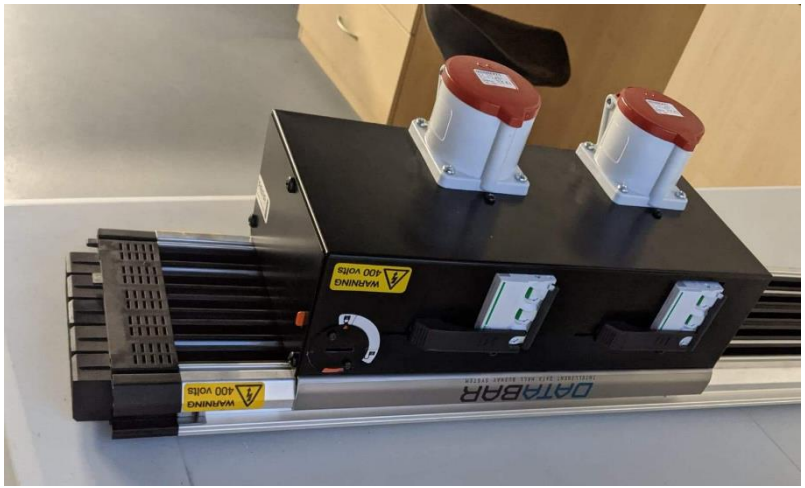


Cooling Technologies 2

Increase of water temperature through IT deployment

Pipes & cables

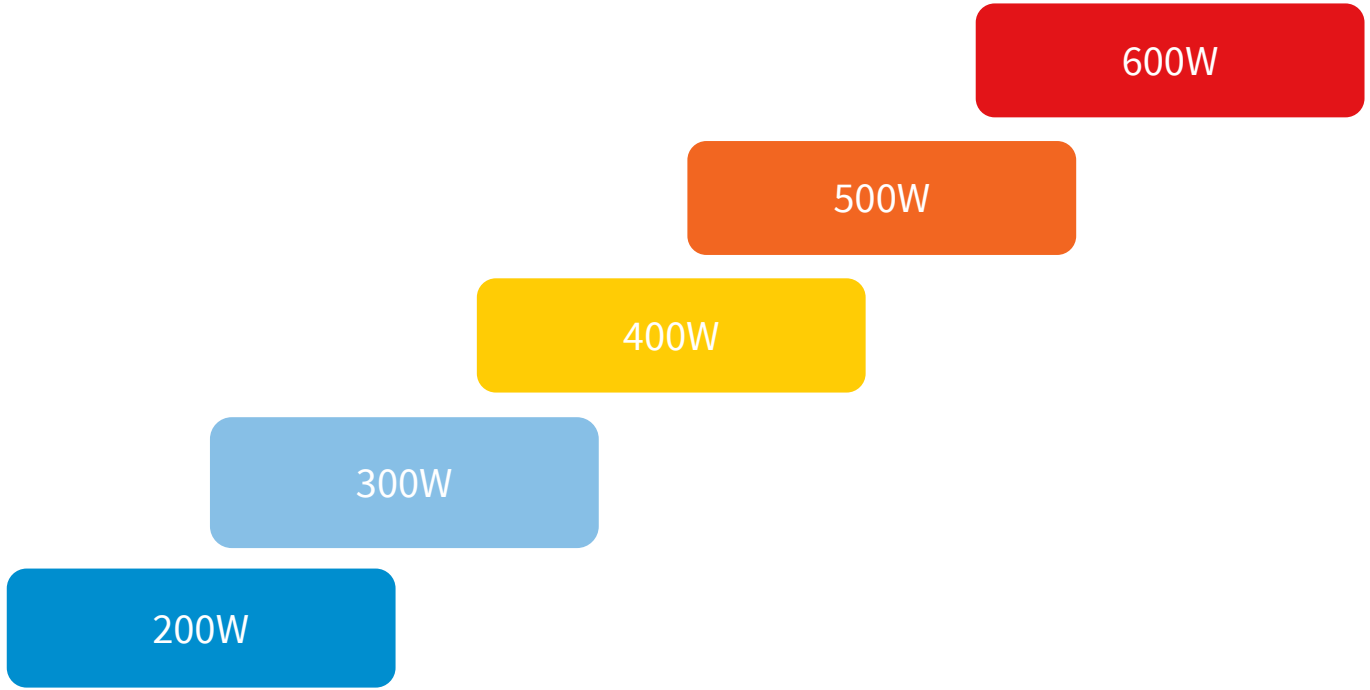
- Modular busbar 410/630A.
- Sizing pipes and valves.



Immersed cooling is real

- Chip manufactures taking notice.
- End user confidence growing.
- Engineers love it.
- Can be incorporated into existing DC infrastructures.

Power, money & space

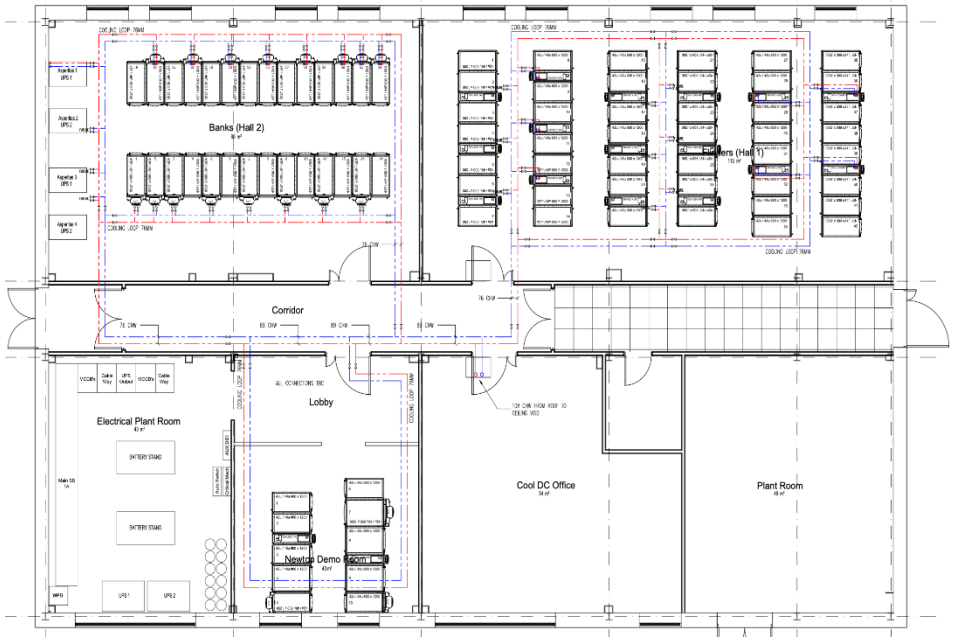


Live example - LDC

- Hybrid Design.
- OCP/HPC.
- CEEDA Gold – Design & Operate, 2019.
- EUCoC Award winner, 2019.
- Global DCD Energy Smart winner, 2019

Sample design - LDC

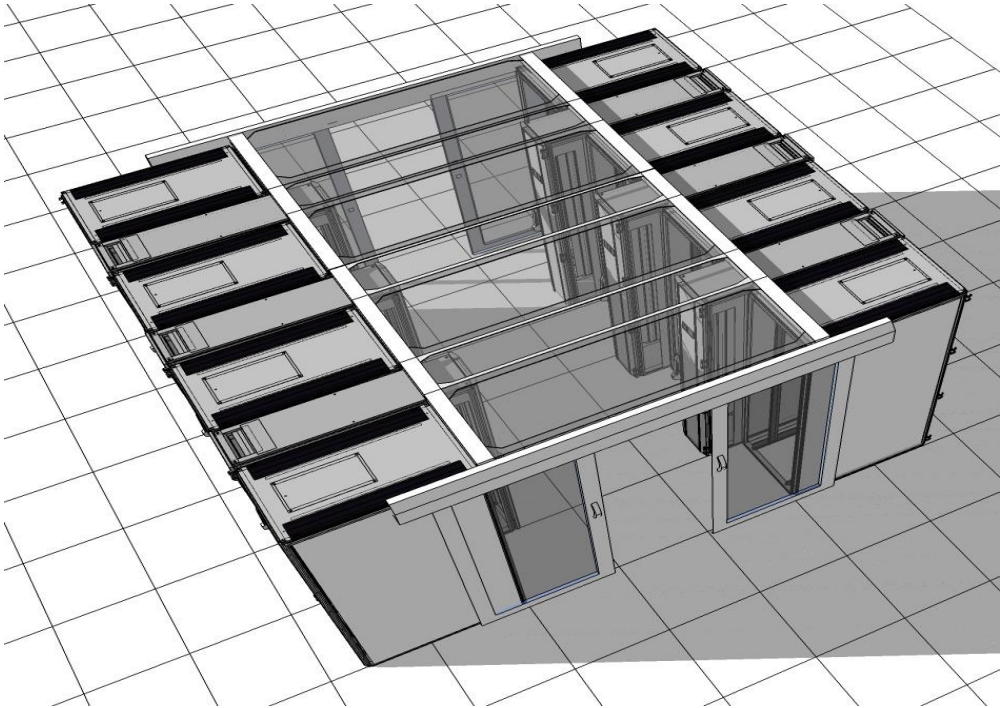
- Mixed-use hybrid environment.
- Raising temperature of surplus heat for in-house energy reuse.



OCP Hot Aisle - LDC

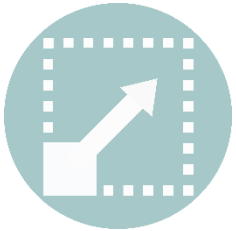
- Rittal LCP.
- 12v and 48v.
- 10kW up to 40kW

- Zuta Core On Chip



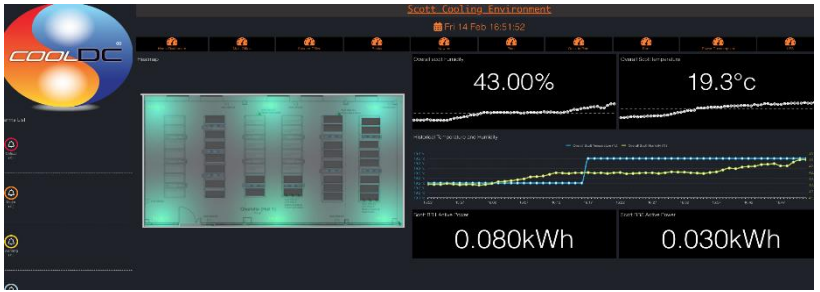
DC of the Future: Prerequisites

- Smaller in scale, but with no loss in power density.
- Energy efficient.
- Carbon neutral.
- Maintained by a younger - more agile - generation of engineers competent in both mechanical and IT.



Take away/lessons learnt

- BMS is key.
- MODBUS a necessity.
- Measurement of flow/return per phase.
- Manufacturer partnership.



7	IReg	Processvalues	Temperature of the oil Left Top	TempOlie_LB_C	600	°C	4	REAL64	R
8	IReg	Processvalues	Temperature of the oil Left Bottom	TempOlie_LO_C	604	°C	4	REAL64	R
9	IReg	Processvalues	Temperature of the oil Middle Top	TempOlie_MB_C	608	°C	4	REAL64	R
0	IReg	Processvalues	Temperature of the oil Middle Bottom	TempOlie_MO_C	612	°C	4	REAL64	R
1	IReg	Processvalues	Temperature of the oil Right Top	TempOlie_RB_C	616	°C	4	REAL64	R
2	IReg	Processvalues	Temperature of the oil Right Bottom	TempOlie_RO_C	620	°C	4	REAL64	R
3	IReg	Processvalues	Temperature of water input left	TempWaterIn_S1_C	624	°C	4	REAL64	R
4	IReg	Processvalues	Temperature of water input right	TempWaterIn_S2_C	628	°C	4	REAL64	R
5	IReg	Processvalues	Temperature of water output left	TempWaterUit_S1_C	632	°C	4	REAL64	R
6	IReg	Processvalues	Temperature of water output right	TempWaterUit_S2_C	636	°C	4	REAL64	R
7	IReg	Processvalues	Flow of water left	FlowWater_S1_C	640	l/m	4	REAL64	R
8	IReg	Processvalues	Flow of water right	FlowWater_S2_C	644	l/m	4	REAL64	R
5	IReg	Processvalues	Pressure of water left	FlowPressure_S1_C	648	bar	4	REAL64	R
0	IReg	Processvalues	Pressure of water right	FlowPressure_S2_C	652	bar	4	REAL64	R
1	IReg	Processvalues	Level switch status (1:lowlow 2:low 3:normal 4: high 5: highigh)	LevelSwitch_C	656		4	REAL64	R
2	DISC	Processvalues	Water detected status	WaterDetected_C	660		1	BOOL8	R

Call to Action

Timelines for following documents -

- ACS Hybrid DC requirements document – July 2020
- ACS Hybrid DC white paper – Sept 2020
- (Update of Data Centre of the Future – Whitepaper)
- ACS Hybrid DC Design Document – December 2020

Links

- https://www.cooldc.co.uk
- https://www.victaulic.com
- http://www.opencompute.org

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