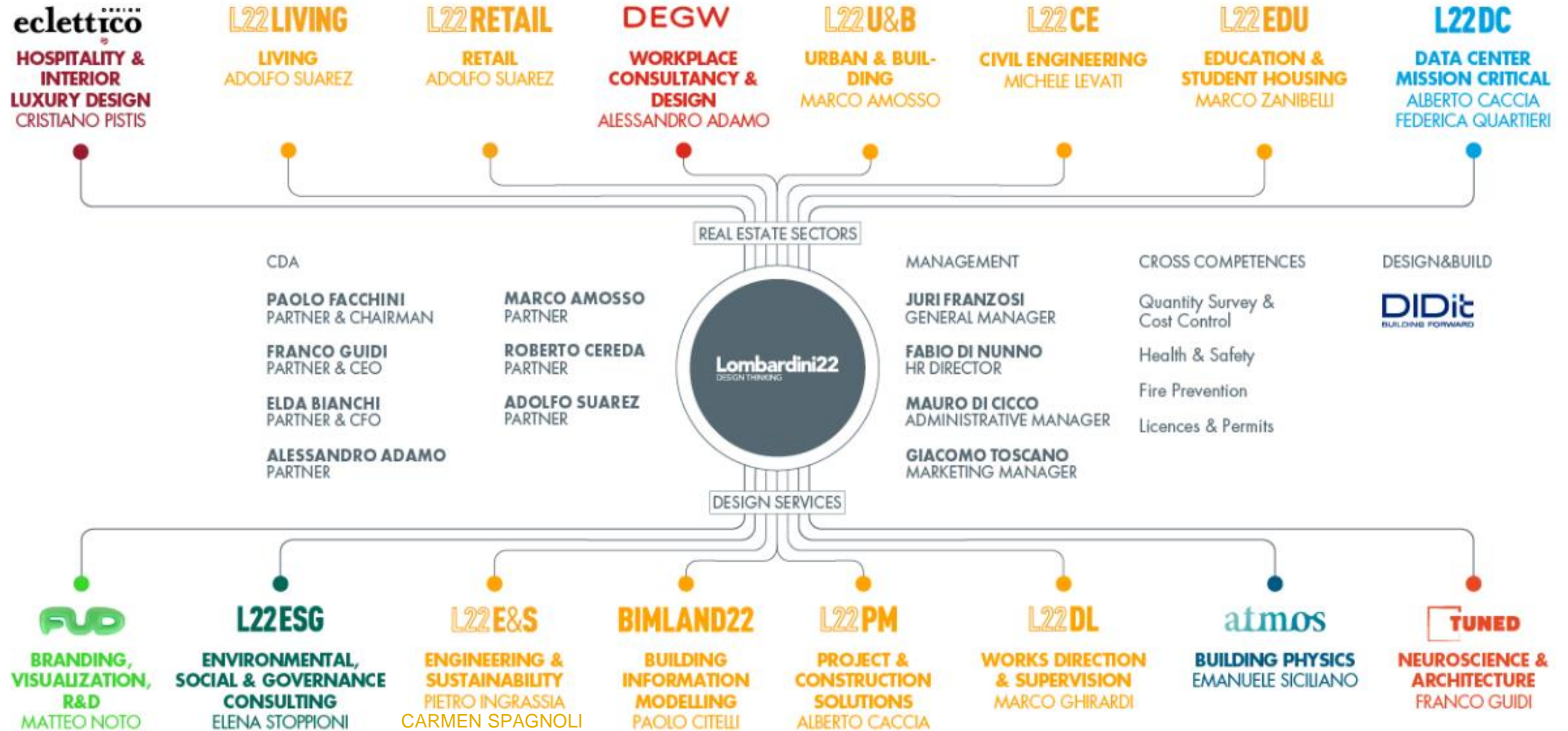


# DCs design and sustainability challenge

# What is Lombardini22

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- Not only a building, not only plants: complex infrastructure
- Strong effort in localization: Guidelines and Client standards can provide general criteria mainly on the infrastructure topology but site constraints are different site by site and can impact
- Specific expertise on all the disciplines (CSA and MEP)
- Certification requirement for both sustainability target and operation



- Flexibility: installation in phases, modular design, redundancy requirement, different tenant requirements
- Construction site & spaces already released
- Green field / brown field / renovation
- Efficiency and sustainability target (ESG, EED and environmental authorization)



- Business Continuity
- Availability: rules of 5 nines, 99,999% that means 5 minutes of interruption in one year
- Reliability: capacity of a system or a single component to execute the required function in defined conditions for a period of time.
- MTTR: mean time to repair
- MTBF: mean time between failure
- Redundancy: N-Base / N+1 / N+x / 2N or N+N





The design of the white space starts from the requirements in terms of IT power, temperatures (both liquid or air cooled systems), RH, positive pressure.

In some cases the requirements are very clear from the end user, while in other cases the designer has to define the conditions used as base of design.

In this case the white paper provided by the ASHRAE T.C. 9,9 has defined the indoor ambient conditions for the different applications.



## Design criteria – environmental conditions: T/RH

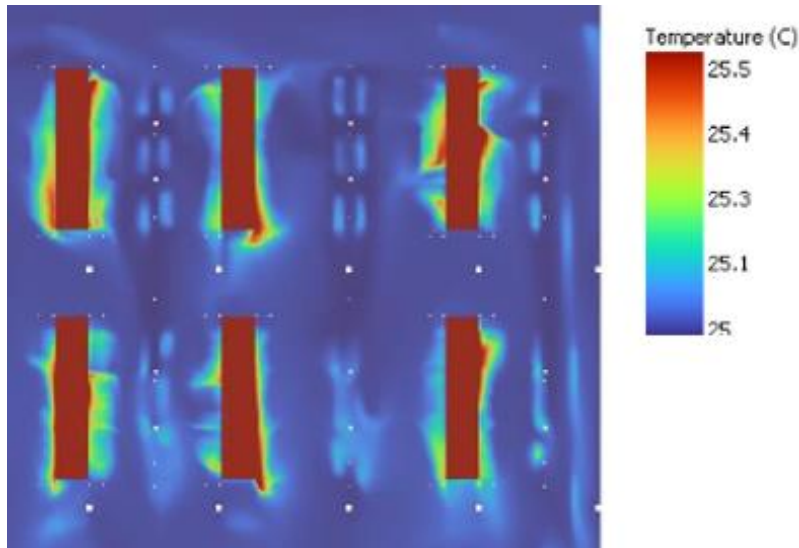
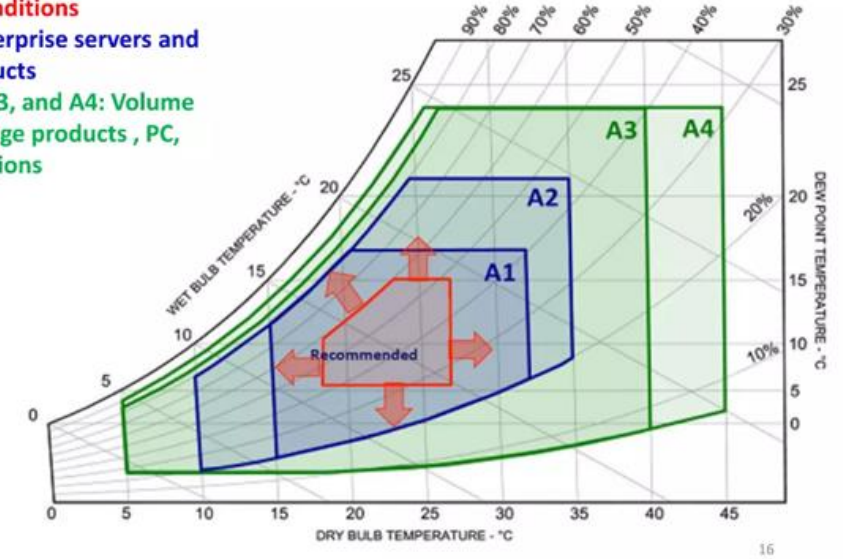
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2011 classes	2008 classes	Applications	IT Equipment	Environmental Control
A1	1	Datacenter	Enterprise servers, storage products	Tightly controlled
A2	2		Volume servers, storage products, personal computers, workstations	Some control
A3	NA		Volume servers, storage products, personal computers, workstations	Some control
A4	NA		Volume servers, storage products, personal computers, workstations	Some control
B	3	Office, home, transportable environment, etc.	Personal computers, workstations, laptops, and printers	Minimal control
C	4	Point-of-sale, industrial, factory, etc.	Point-of-sale equipment, ruggedized controllers, or computers and PDAs	No control

**Recommended: Under normal operating conditions**

**Class A1: Enterprise servers and storage products**

**Classes A2, A3, and A4: Volume servers, storage products, PC, and workstations**



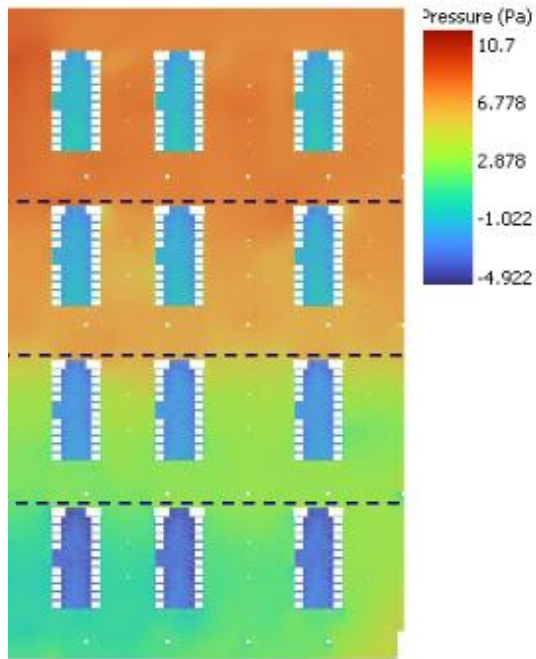


Figure 1: Air flow from ACU 5.1 supply:

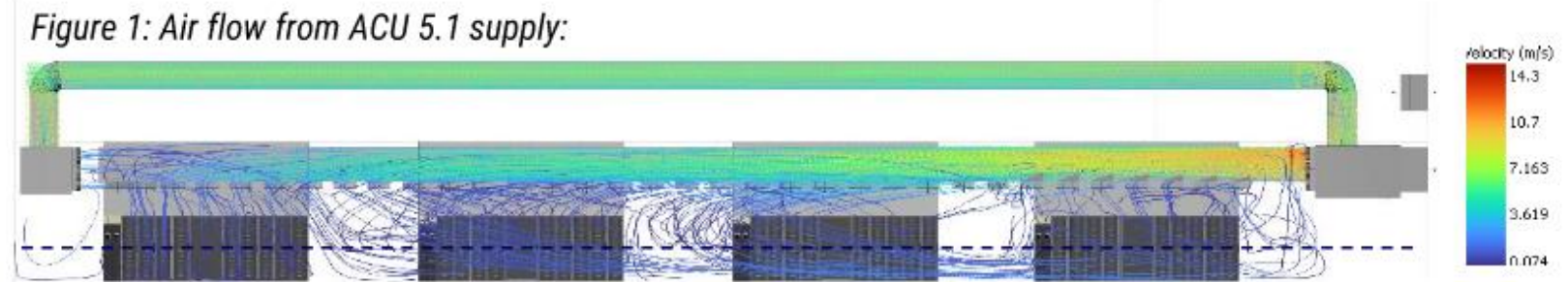
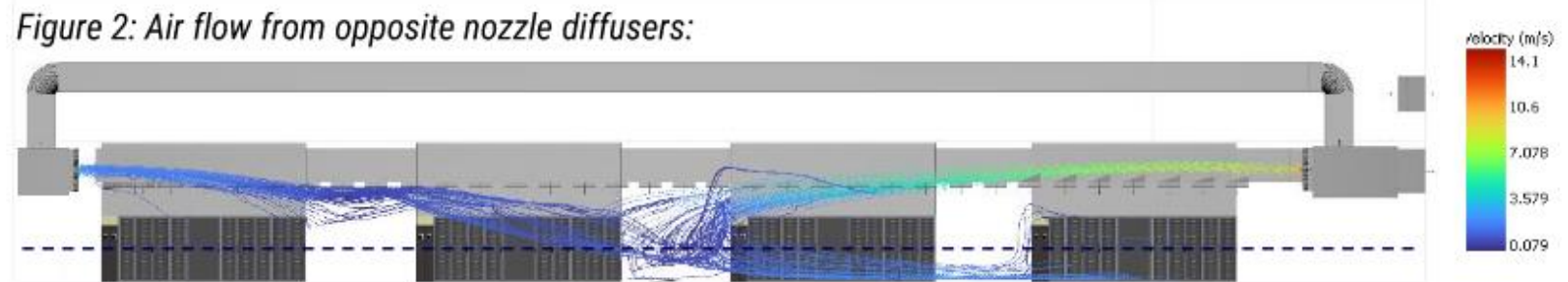


Figure 2: Air flow from opposite nozzle diffusers:

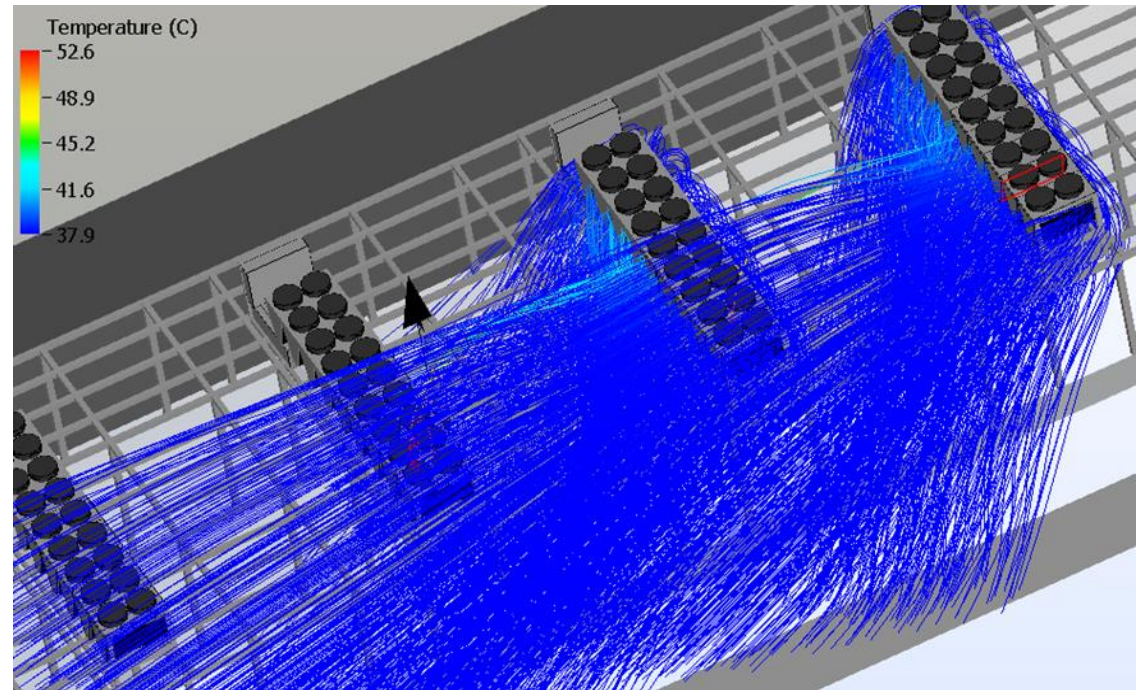
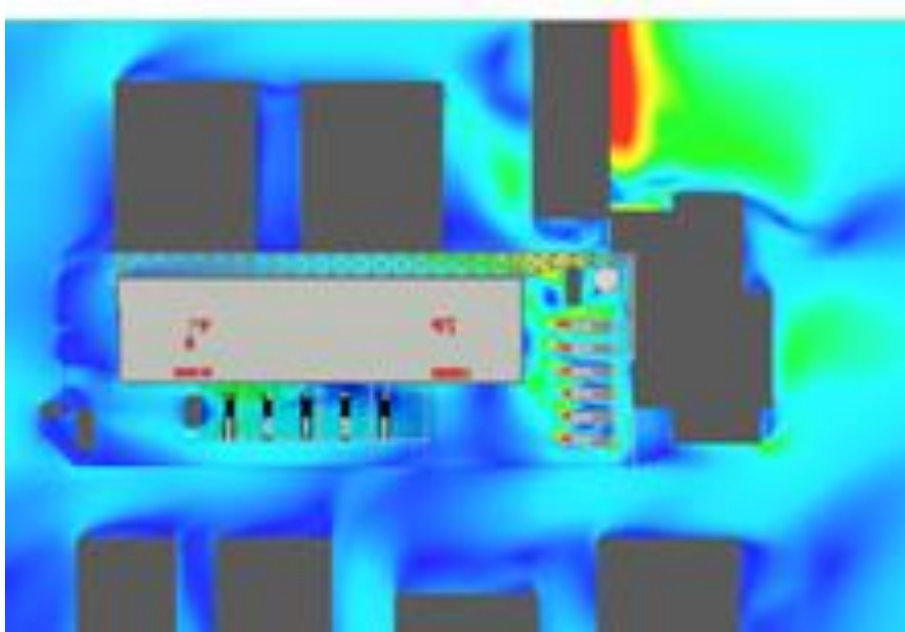






## Design criteria – environmental conditions: outdoor

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DC are infrastructures that have to be designed according to sustainability criteria.  
From the EED:

*«The ICT sector is another important sector which receives increasing attention. In 2018 the energy consumption of data centres in the Union was 76,8 TWh. This is expected to rise to 98,5 TWh by 2030, a 28 % increase. This increase in absolute terms can also be seen in relative terms: within the Union, data centres accounted for 2,7 % of electricity demand in 2018 and will reach 3,21 % by 2030 if development continues on the current trajectory. The Union's Digital Strategy already highlighted the need for highly energy-efficient and sustainable data centres and calls for transparency measures for telecommunication operators on their environmental footprint.*

*To promote sustainable development in the ICT sector, particularly of data centres, Member States should require the collection and publication of data which are relevant for the energy performance, water footprint and demand-side flexibility of data centres, on the basis of a common Union template»*

Energy efficiency is one of the goals to design a sustainable data center but it is not the only one.

## Definition of key performance factors [ISO IEC 30134 - CEN/CENELEC EN 50600]

- PUE: power usage effectiveness
- WUE: water usage effectiveness
- ERF: energy reuse factor
- REF: renewable energy factor
- CUE: carbon usage effectiveness (not included in the EED)

### Other design strategy:

- Waste management – circular economy
- Potable water saving & rainwater reuse
- Life cycle analysis – selection of materials
- Low GWP gases



European Code of Conduct for Energy Efficiency in Data Centres: It encourages and guides data centre operators and owners in cost-effectively reducing energy consumption without compromising the mission-critical function of these facilities.

ANSI/ASHRAE Standard 90.4: was initiated to promote energy-efficient design of data centers. It establishes the minimum energy efficiency requirements of data center for design, construction and use of on-site or off-site renewable energy sources.

Climate Neutral Data Centre Pact: To ensure data centres are an integral part of the sustainable future of Europe, data centre operators and trade associations agree to make data centres climate neutral by 2030

Leadership in Energy and Environmental Design – LEED: is the world's most widely used green building rating system. LEED certification provides a framework for healthy, highly efficient, and cost-saving green buildings, which offer environmental, social and governance benefits.

# Thank you