

Recommendation

ITU-T L.1327 (08/2024)

SERIES L: Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

Energy efficiency, smart energy and green data centres

Guidelines on the selection of cooling technologies for data centres in multiple scenarios

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Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

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Recommendation ITU-T L.1327

Guidelines on the selection of cooling technologies for data centres in multiple scenarios

Summary

Recommendation ITU-T L.1327 describes a universal data centre cooling technology selection method at its current industry development stage by matching detailed analysis of such technology and typical application scenarios.

- 1) Industry mainstream data centre cooling system solutions are categorized and summarized, and their technical principles, characteristics and routes analysed in detail to provide a basis for technology selection.
- 2) The complete cooling system is then divided into a number of processing components, and key factors affecting their performance are identified by analysing their technical principles.
- 3) Common data centre application scenarios are then classified from different dimensions, excluding those that have little or no impact on cooling, to identify appropriate scenarios for the performance of each processing component in a cooling system.
- 4) Single dimensional application scenarios are integrated into those that are multi-dimensional in line with the actual situation. Corresponding cooling system processing components are then integrated into a complete cooling programme to finalize technology selection for a data centre project.

Current data centre cooling technology presents complex, diverse and fast update characteristics. There are many factors affecting actual application of cooling technology and data centres are usually faced with multi-dimensional and complex scenarios. A selection method for an appropriate cooling technology in different application scenarios has become key to the safe energy-saving operation of a data centre.

History*

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Introduction

To support continuous development of artificial intelligence (AI), big data, cloud computing and other new applications, data centres in various regions of the world are increasing in scale, with a variety of construction forms and a rapid increase in power consumption. As a key component of data centre infrastructure, the cooling system has become a focus of attention in the industry due to its ability to meet the ever-increasing power density demand and huge energy-saving potential. This Recommendation introduces a methodology for selecting cooling technologies for data centres.

- 1) Current common data centre hardware mainly includes cooling systems of the following types: water; direct expansion; evaporative; and liquid. Water-cooling systems mainly include chilled water systems that are water or air cooled (mainly used in cold regions). Direct expansion cooling systems include refrigerant pump air conditioning of the following types: split; multi-connected; or integrated. Evaporative cooling systems include indirect evaporative cooling air-handling units. Liquid cooling systems include the following types: cold plate, immersion or spray.
- 2) The main components of a data centre cooling system employ processes including: indoor heat exchange; outdoor heat dissipation; coolant (refrigerant, water, etc.) transmission and distribution; and refrigeration.
- 3) The application scenarios affecting the selection of cooling technology for data centres mainly include local climate, construction form and business scenarios, which respectively affect the technical selection of refrigeration type, external heat dissipation, coolant transmission and distribution, and internal heat exchange of the cooling system.
- 4) Comprehensive multi-dimensional scenarios and cooling technologies of data centres are matched, and suggestions made for cooling technology selection under actual application scenarios.

Based on the preceding discussion, it is necessary to formulate and study cooling technology selection guidelines for data centres under multiple scenarios.