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Partie 1: Équipement informatique des centres de traitement de données

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 39, *Sustainability, IT and data centres*.

A list of all parts in the ISO/IEC 8236 series can be found on the ISO and IEC websites.

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Introduction

The global economy is increasingly more reliant on information and communication technologies and the associated generation, transmission, compute and storage of digital data. All markets have experienced growth in the digital data for social, educational, medical and business sectors. There are a wide variety of data centres within private enterprise, shared/collocation and cloud service providers that meet the growing demands of the digital data. The growth of this digital data will continue at a rapid pace with the development of devices within the "Internet of Things" category, artificial intelligence applications and the increased ability to generate and transmit data while mobile with the deployment of 5G technology. With the transition from air-cooled information technology (IT) equipment to liquid-cooling IT equipment technologies, with the advent of processors with higher thermal design power (TDP) characteristics, resulting in higher power densities, it is also important to coordinate IT air-cooled vs liquid-cooled provisioning plans with facility provisioning plans.

Compute and storage technologies and requirements continue to change rapidly. This creates challenges for IT professionals who are responsible for planning for the provisioning compute and storage systems, and the networks interconnecting the systems. Data centre IT systems and platform ecosystems typically have lifecycles of 3 to 5 years. However, using traditional methods, IT provisioning planners are challenged to identify provisioning requirements beyond even 1 year. This results in significant challenges for data centre facility provisioning planners who are responsible for identifying requirements for data centre facility systems that have life cycles of 10 to 25 years.

Data centre IT personnel responsible for provisioning IT systems are often unfamiliar with how the IT systems impact facility planning. They are also often unfamiliar with the abundance of information that is available to them that can help them to develop a holistic, long-term plan for provisioning data centres. This has resulted in reactive provisioning. This has also impeded data centre facilities personnel responsible for planning power, cooling and space provisioning. The data centre facilities personnel have little or no knowledge of IT requirements or advanced notice of facility system capacities required to support IT systems that are to be deployed within the data centre.

With this background, growth of digital data is inevitable, and the reactive planning status quo will result in greater frustration for both the IT and facilities provisioning planners. There is therefore a need for a method to benchmark and trend IT provisioning using standard indicators, processes, and reporting.

A data centre provisioning key performance indicator (KPI) will provide a method to profile future IT system requirements over the life of the infrastructure. This method is based on the data centre's current IT applications and equipment platform, their expansion or contraction trends, and the impact of future changes in technology network, compute and storage processing density and efficiency. This will help guide designers and planners to optimize the capacity of the infrastructure to support the IT systems, providing greater efficiency of the infrastructure resources implemented.

This document, in combination with ISO/IEC TS 8236-2, defines the benchmarking, trending and reporting methodologies to be used to develop a holistic long-term provisioning plan.

The data centre provisioning KPI will be influential in guiding data centre designers and planners when developing a design power usage effectiveness (dPUE) defined in ISO/IEC 30134-2. The data centre provisioning KPI can be used in place of an arbitrary estimated IT load to develop the dPUE. The data centre provisioning KPI will provide owners, designers and planners the opportunity to forecast IT loads using a consistent methodology based on the provisioning profile.

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Information technology — Provisioning, forecasting and management —

Part 1:
Data centre IT equipment

1 Scope

This document specifies a standardized method of optimizing IT provisioning within data centres by utilizing KPIs that enable the development of IT profiles for individual systems or platforms. The combination of the system and platform KPIs are used to establish an IT provisioning profile, establishing standard forecasting methods to optimize data centre resource effectiveness.

This document:

a) defines a method for identifying benchmarks and trends in IT provisioning;

b) provides capability assessment/indicators of IT equipment over infrastructure life cycle, including preparatory, commissioning, expansion/contraction and/or retirement of IT equipment;

c) provides a framework to establish IT provisioning forecast;

d) provides a framework for IT provisioning output to be used as input to facility provisioning of space, power and cooling capacity requirements (see ISO/IEC TS 8236-2).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC/TS 8236-2, *Information technology — Provisioning, forecasting and management — Part 2: Data centre facility*

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC TS 8236-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
data centre operations team
entity responsible for day-to-day and short-term tasks required to ensure IT services, or facility infrastructure, are available and functional

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3.1.2
drive density
volume of storage per physical size of storage device (e.g. areal density for hard disk drives)

3.1.3
IT platform
subset of equipment within an IT system to differentiate between various type of equipment, or a subset of equipment across multiple IT systems grouped to associate various types of equipment, by physical, logical or function characteristics, such as form factor, class, generation, application, etc.

3.1.4
IT system
set of one or more IT equipment providing network, compute or storage, or any combination of network, compute or storage

3.1.5
single purpose system
IT system with a single operating system supporting a single application or function, non-virtualized

3.1.6
system
components grouped together to provide increased capacity or redundancy, or components integrated together to provide required functionality

3.1.7
thermal design power
maximum amount of heat a CPU or GPU generates

3.1.8
virtual guest
operating system and the operating system's integrated applications residing on a virtual host system (commonly referred to as a virtual server), or bins and libraries integrated with applications residing on a host system (commonly referred to as a container server)

3.1.9
virtual host
one or more physical IT devices (acting together for more capacity/ redundancy) as a host, supporting multiple virtual machine guests

3.1.10
virtual to physical ratio
quantity of virtual guests on a virtual host expressed as a ratio, can be expressed as an average of total quantity of virtual guests versus the quantity of virtual hosts all the guests are installed on

3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO/IEC TS 8236-2 and the following apply.

CMDB	configuration management database
DCitP	data centre IT provisioning
DCfP	data centre facility provisioning
HPC	high performance computing
LC-IT	liquid cooled information technology
LFF	large form factor server with a profile greater than two rack units

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P IT platform, data illustrating historic trends or forecasts

RU rack unit

SaaS software as a service

SFF small form factor server with a profile of 2RU or less

TDP thermal design power

V2P quantity of virtual machine guests on a virtual machine host expressed as a ratio

3.3 Symbols

For the purposes of this document, the following symbols apply.

B business strategy variable

β linear regression model

C_{LC} life cycle

D_{R} normal quantity of platform devices per rack or cabinet

m number of platform trends

R_{MRU} maximum rack units available within a cabinet for platform used to plan provisioning, excluding any rack units required for other devices such as horizontal power strips, horizontal grounding bars, network devices, patch panels, horizontal cable management, or blank rack units

n number of historic data points in a platform trend

P platform, data illustrating historic trends or forecasts

$P_{i,j,k}$ platform where "i" represents the quantity of platforms within DCitP, "j" represents the quantity of variables within the platform, and "k" represents the quantity of data points in the trend or forecast

P_{PHY} physical servers per chassis for platform

NOTE Small and large form factor platforms have one server per chassis. A blade platform typically has eight servers per chassis for full height servers or 16 servers per chassis for half height servers.

R_{RU} height of single chassis of platform, measured in rack units

R_{TRU} total rack units

R_{CRU} consumed rack units within rack or cabinet

R_{RUD} rack units per platform device

s number of data points in a platform provisioning forecast

S_{RS} refresh space

T technology variable

t time

W weighting factor

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y one or more variables used to establish a unique trend for the provisioning profile

η_{IT} data centre IT provisioning

4 Data centre IT provisioning

4.1 Introduction

The data centre industry has historically been challenged with a disconnect between IT and facilities personnel responsible for designing, planning and implementing the systems for which they are responsible. This challenge is primarily the result of both the IT and facility planners responsible for the physical systems and infrastructure not participating, either by choice or by organizational structure and processes, in the planning of the applications that the data centre is to support and the requirements of those applications.

The primary requirement in developing a data centre IT provisioning profile is to identify IT trends. The profiles are developed by analysing and extrapolating historic trend data to estimate future requirements.

The trends may consist of growth or contraction. The trends for any data centre provisioning profile consists of known trends, such as a known trend of increase in the amount of data required to be retained, or variables, such as the change in storage drive density with each storage platform technology refresh over a defined period of time.

The trends can identify a growth in infrastructure requirements such as when the data required to be retained is growing at a rate that exceeds the rate in which storage drive densities increase with each technology refresh, i.e. additional drives required at each technology refresh. The trends can also identify a contraction in infrastructure requirements such as when the storage drive densities increase with each technology refresh at a rate that exceeds the rate of increasing data required to be retained, i.e. fewer drives required at each technology refresh.

IT trends are unique for each organization operating a data centre. IT trends can also be unique between different data centres operated by a single organization. IT trends are influenced by an organization's tactic regarding new emerging technologies. IT trends can change rapidly with the development of new technologies, however a specific organization's deployment of new technology typically lag this rate depending on their internal adoption rate of new technologies, such as bleeding edge, cutting edge, leading edge or lagging. An organization may also have differing adoption rates across the various technologies and platforms within their data centre.

IT trends and the resulting IT provisioning profiles are not intended to compare data centres. They are intended to develop a profile that can guide designers and planners on future infrastructure capacity requirements and energy consumption for a specific data centre based on the applications, IT systems and platforms within the specific data centre.

4.2 IT provisioning trends

The level of detail and granularity required for IT trend analyse vary depending on the number of applications supported within the data centre, the variation of IT systems and platforms supporting the applications, and the availability of past trend data. This document is not intended to define specific trend data or units of measure that are required for analyse. This document is intended to identify a methodology that can be applied to any application, IT system, platform or data centre in developing IT provisioning profiles.

The IT trends are often characterized into one of three top-level platforms; compute, storage and network. The use of lower-level platforms can increase the granularity of the IT equipment analysis, such as defining platforms by physical attributes, logical attributes or functional attributes. A mix of the top-level and lower-level platforms are used to provide further detail and compartmentalization of IT equipment or grouping of associated IT equipment.

The compute, storage and network top-level and various lower-level platforms is discussed within this document. However, many other platform characteristics exist and may be used to develop suitable data centre IT provisioning profiles. Independent of how the platforms are characterized, all IT equipment

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