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Part 5: IT Equipment Utilization for servers (ITEUsv)

Technologies de l'information — Centres de traitement de données — Indicateurs de performance clés —

Partie 5: Utilisation des appareils de technologies de l'information (TI) se rapportant aux serveurs



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/JTC 1, *Information technology*, Subcommittee SC 39, *Sustainability for and by Information Technology*.

A list of all parts in the ISO 30134 series can be found on the ISO website.

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Introduction

The global economy is now reliant on information and communication technologies and the associated generation, transmission, dissemination, computation and storage of digital data. All markets have experienced exponential growth in that data for social, educational and business sectors and, while the Internet backbone carries the traffic, there are a wide variety of data centres at nodes and hubs within both private enterprise and shared/collocation facilities.

The historical data generation growth rate exceeds the capacity growth rate of the information and communications technology hardware and, with less than half of the world's population having access to an Internet connection as of 2014, that growth in data can only accelerate. In addition, with many governments having “digital agendas" to provide both citizens and businesses with faster broadband access, the very increase in network speed and capacity will, by itself, generate more usage (Jevon's Paradox). Data generation and the consequential increase in data manipulation and storage are directly linked to increasing power consumption.

With this background, it is clear that data centre growth, and power consumption in particular, is an inevitable consequence and that growth will demand increasing power consumption despite the most stringent energy efficiency strategies. This makes the need for Key Performance Indicators (KPIs) that cover the effective use of resources (including, but not limited to, energy) and the reduction of CO_2 emissions essential.

In order to determine the overall resource effectiveness or efficiency of a data centre, a holistic suite of metrics is required. For the resource effectiveness or efficiency of data centre infrastructures, power usage effectiveness (PUE) was defined in ISO/IEC 30134-2. PUE will be utilized to measure and improve energy efficiency of data centre infrastructures, such as cooling systems and power supply systems. For data centres that own not only infrastructure but also IT equipment, it is also necessary to measure and improve energy effectiveness or efficiency of their IT equipment. A data centre, which provides only infrastructure to the customer, is called a co-location data centre or housing service provider. For these data centres, PUE is essential. On the other hand, a data centre which owns and provides server, storage and network equipment is called a hosting or cloud service provider. These service providers can manage IT equipment and improve the energy effectiveness of a data centre by improving the energy effectiveness of the IT equipment which they own.

This document specifies the IT Equipment Utilization for servers in a Data Centre (ITEUsv) which specifies a method for measuring the average utilization of server equipment in a data centre. A data centre which owns servers can use this document to determine the average utilization of their current server equipment and to improve energy effectiveness by increasing the average utilization of servers. IT equipment installed in a data centre consists of servers, storage systems and network equipment. But it is difficult to calculate the summarized utilization among different types of IT equipment since the metrics for measuring their performance are different and a simple addition or average is not an appropriate method for summarizing. ITEUsv defines the method to obtain the average utilization of servers.

One approach to improve the resource effectiveness or efficiency of servers in a data centre is to

— improve the utilization ratio of servers by using such technologies as virtualization and server consolidation for sharing use of servers, and

— reduce the number of servers to achieve the same level of information processing.

ITEUsv is a KPI used to quantify the effects of this approach.

This document is part of a series of International Standards for such KPIs and has been produced in accordance with ISO/IEC 30134-1, which defines common requirements for a holistic suite of KPIs for data centre resource usage effectiveness or efficiency.

The ISO/IEC 30134 series does not specify limits or targets for any KPI and does not describe or imply, unless specifically stated, any form of aggregation of individual KPIs into a combined nor an overall KPI for data centre resource usage effectiveness or efficiency.

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Information technology — Data centres — Key performance indicators —

Part 5: IT Equipment Utilization for servers (ITEUsv)

1 Scope

This document specifies the IT Equipment Utilization for servers (ITEUsv) as a Key Performance Indicator (KPI) to quantify the utilization of servers in a data centre. This document is intended as a KPI for improving the aggregate energy efficiency of servers in a given data centre.

This document

a) describes the purposes of ITEUsv,

b) defines ITEUsv in a conceptual manner,

c) describes how to use ITEUsv, and

d) describes reporting of ITEUsv.

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 30134-1, *Information technology — Data centres — Key performance indicators — Part 1: Overview and general requirements*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 30134-1 and the following apply.

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

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

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

3.1.1
Information Technology Equipment Utilization for servers
ITEUsv
average utilization ratio of all servers or a group of servers in a data centre

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3.1.2
server
functional unit that provides services to workstations, to personal computers or to other functional units in a computer network

Note 1 to entry: Services may be dedicated services or shared services.

[SOURCE: IEC 60050-732:2010, 732-01-12, modified, Note 2 deleted.]

3.2 Abbreviated terms

CUS CPU Utilization ratio of Server

CPU Central Processing Unit

ITEEsv IT Equipment Energy Efficiency for Servers

ITEUsv IT Equipment Utilization for Servers

4 Relevance of ITEUsv

ITEUsv is a KPI which describes the utilization of the server equipment in the data centre in operational conditions. ITEUsv is developed with the knowledge that server energy efficiency tends to be optimal with higher utilization level. However, 100 % utilization may not necessarily be the optimal energy efficiency level. With some CPU architectures, high utilization, not peak utilization is more efficient.

Server energy effectiveness is a combination of

a) the capacity to do work per unit of energy (capability),

b) the amount of time the server is actually doing work (utilization), and

c) the ability of the server to reduce the energy consumption when the server is not fully loaded (power management).

ITEUsv accounts for utilization [see b)] and power management [see c)] aspects and is used to quantify the impact of one or both of the following:

— improving utilization ratio of servers by using such technologies as virtualization and server consolidation for sharing use of servers;

— reducing the number of servers to achieve the same level of information processing.

Capability [see a)] is addressed in ISO/IEC 30134-4.

NOTE ITEUsv does not involve data centre infrastructure such as air conditioning. IT equipment in the data centre includes servers, storage systems, and network equipment. ITEUsv only addresses utilization and power management of servers.

ITEUsv is a KPI intended for self-improvement of a given data centre and not for comparison among different data centres.

5 Determination of *ITEUsv(t)*

$CUS_i(t)$ is the average CPU utilization for server *i* at time *t*, measured by use of a performance monitoring tool provided by a server operating system. For performance monitoring tools, see A.2. When there are

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