

First edition
2016-04-15

Information technology — Data centres — Key performance indicators —

Part 2: Power usage effectiveness (PUE)

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

Partie 2: Efficacité dans l'utilisation de la puissance (PUE)



Reference number
ISO/IEC 30134-2:2016(E)

© ISO/IEC 2016



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

This is a preview of "ISO/IEC 30134-2:2016". Click here to purchase the full version from the ANSI store.

Contents

| | Page |
|---|-----------|
| Foreword | iv |
| Introduction | v |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms, definitions, abbreviated terms and symbols | 1 |
| 3.1 Terms and definitions..... | 1 |
| 3.2 Abbreviated terms..... | 2 |
| 3.3 Symbols..... | 2 |
| 4 Applicable areas of the data centre | 3 |
| 5 Determination of power usage effectiveness (PUE) | 3 |
| 6 Measurement of power usage effectiveness | 4 |
| 6.1 Measuring energy consumption..... | 4 |
| 6.1.1 General..... | 4 |
| 6.1.2 Measurement period and frequency..... | 4 |
| 6.1.3 Meter and measurement requirements..... | 4 |
| 6.2 Categories of power usage effectiveness..... | 5 |
| 6.2.1 General..... | 5 |
| 6.2.2 Category 1 (PUE ₁) — Basic resolution..... | 5 |
| 6.2.3 Category 2 (PUE ₂) — Intermediate resolution..... | 5 |
| 6.2.4 Category 3 (PUE ₃) — Advanced resolution..... | 6 |
| 6.2.5 Measurement placement..... | 6 |
| 7 Reporting of power usage effectiveness | 6 |
| 7.1 Requirements..... | 6 |
| 7.1.1 Standard construct for communicating PUE data..... | 6 |
| 7.1.2 Example of reporting PUE values..... | 6 |
| 7.1.3 Data for public reporting of PUE..... | 6 |
| 7.2 Recommendations..... | 7 |
| 7.2.1 Use of PUE category..... | 7 |
| 7.2.2 Trend tracking data..... | 7 |
| Annex A (normative) Energy measurements | 9 |
| Annex B (normative) Calculation of PUE using various energy supplies | 11 |
| Annex C (normative) PUE derivatives | 16 |
| Annex D (informative) Interpretation of PUE and its derivatives | 23 |
| Bibliography | 25 |

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 39, *Sustainability for and by Information Technology*.

ISO/IEC 30134 consists of the following parts, under the general title *Information technology — Data centres — Key performance indicators*:

- *Part 1: Overview and general requirements*
- *Part 2: Power usage effectiveness (PUE)*
- *Part 3: Renewable energy factor (REF)*

The following parts are under preparation:

- *Part 4: IT Equipment Energy Efficiency for Servers (ITEEsv)*
- *Part 5: IT Equipment Utilization for Servers (ITEUsv)*

This is a preview of "ISO/IEC 30134-2:2016". [Click here to purchase the full version from the ANSI store.](#)

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 (in 2014) of the world's population having access to an internet connection, that growth in data can only accelerate. In addition, with many governments having "digital agendas" to provide both citizens and businesses with ever faster broadband access, the very increase in network speed and capacity will, by itself, generate ever more usage (Jevons 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 CO₂ emissions essential.

Within the ISO/IEC 30134 series, the term "*resource usage effectiveness*" is more generally used for KPIs in preference to "*resource usage efficiency*", which is restricted to situations where the input and output parameters used to define the KPI have the same units.

In order to determine the overall resource effectiveness or efficiency of a data centre, a holistic suite of metrics is required. This part of ISO/IEC 30134 specifies power usage effectiveness (PUE), which has become a popular metric to determine the efficient utilization and distribution of energy resources within a data centre.

NOTE It is recognized that the term "efficiency" is to be employed for PUE but "effectiveness" provides continuity with earlier market recognition of the term.

This part of ISO/IEC 30134 belongs to a series of 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.