WS Energy efficiency in cloud computing

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Who I am

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  DKE German Commission for Electrical,
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- Secretary CEN/CENELEC/ETSI Coordination Group Green Data Centres
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  Secretary ISO/IEC JTC 1/SC 25/WG 3
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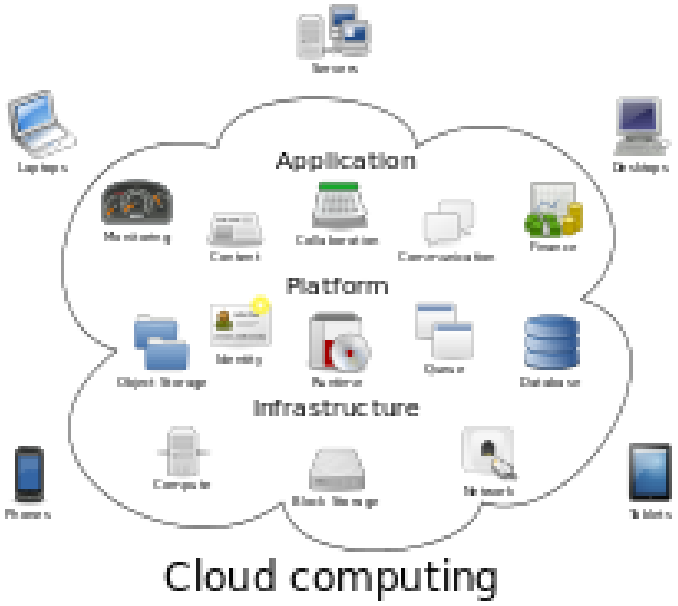
  Member in BITKOM committee on data centres
- DKE is the German national platform for standardisation in the field of Electrical, Electronics and Information Technologies. DKE is the German member of the International Electrotechnical Commission (IEC) and the European Commitee for Electrotechnical Standardistion (CENELEC) as well as the National Standards Organisation of ETSI (European Telecommunications Standards Institute).
- DKE is an opertional division of VDE Association for Electrical, Electronic and Information Technologies e.V. and a standardization committee of DIN Deutsches Institut für Normung e.V..

Cloud Computing – old wine in new bottles?

“The cloud is just another dude’s data centre”

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.

The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server.



Source: WIKIPEDIA

Basic elements of cloud computing

- **Data centre facilities and infrastructures**
  - servers, storage, internal IT network
  - power supply and distribution, cooling & ventilation, security systems
- **Communication networks**
  - wired & mobile access networks
  - core network
- **Operations and management**
  - product level: energy efficient equipment
  - system level: energy efficient operation of (distributed) data centre facilities & communication networks
    - virtualization
    - efficient application software
    - efficient cloud (scaling) management
- **Client devices**
  - wired terminals and mobile

The motivation for (European) standardization activities

- **Stakeholder request to provide European Norms on data centres**
  - CENELEC/TC 215/WG 3 (established 2009): EN 50600 series (performed under M/462)

- **Standardization Mandate M/462 (2010-04)**
  - addressed to CEN, CENELEC and ETSI
  - in the field of ICT to enable efficient energy use in fixed and mobile information and communication networks
  - executed by CENELEC/TC 215/WG 3 and ETSI/TC ATTM, TC CABLE, TC EE and ISG EOU (Industry Specification Group on Operational energy Efficiency for Users)

- **Draft standardization request (2019-07)** on servers and data storage products in support of Commission Regulation (EU) 2019/424

A coordinated approach to European standardization

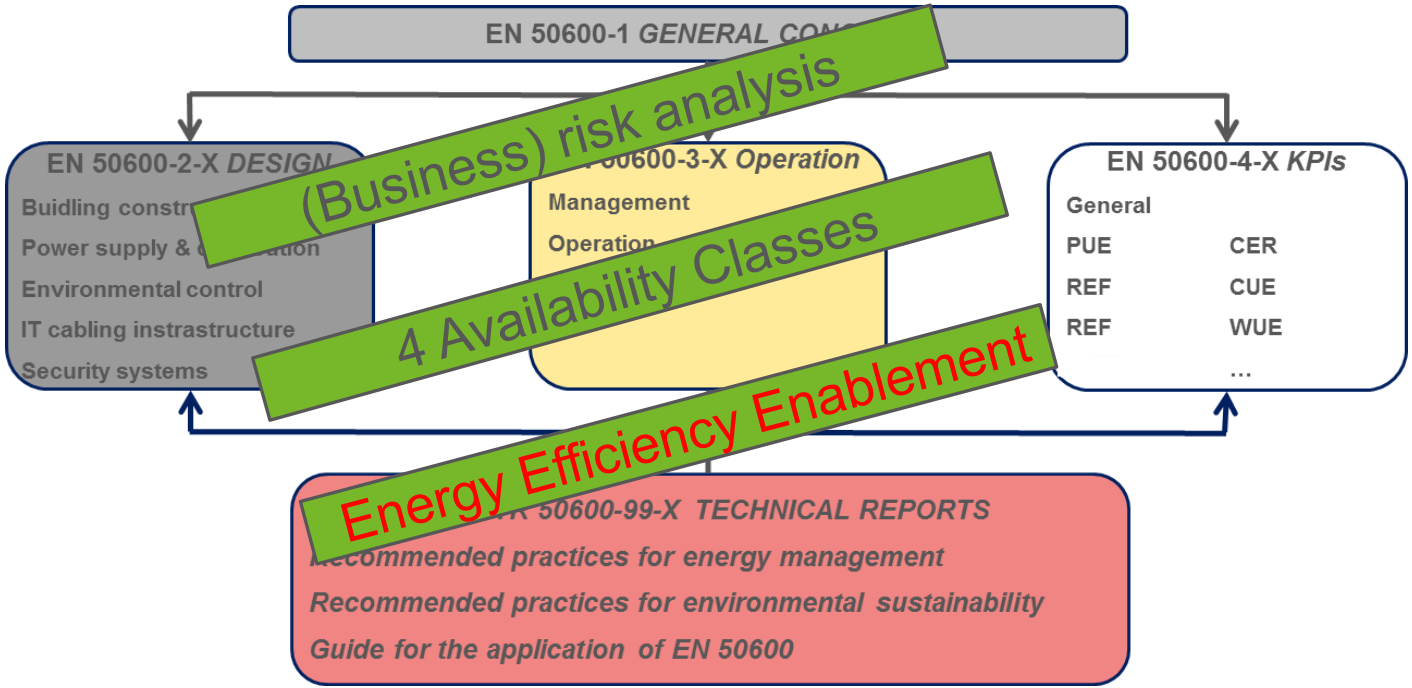
CEN/CENELEC/ETSI Coordination Group Green Data Centres

- Established in 2010 as successor of CENELEC/BTWG 132-3
- Management body, coordinates standardization activities to avoid duplication of or conflicting requirements in European standards
- Two white papers (annually updated):
  - Energy Management and Environmental Viability of Data Centres
  - Standardisation landscape for the energy management and environmental viability of data centres

https://www.cen.eu/work/Sectors/Digital_society/Pages/GreenDataCentres.aspx

Standardisation overview (1)

Data centre facilities and infrastructures – EN 50600 series (CLC/TC 215)



Standardisation overview (2)

Communication networks – ETSI technical work

- Performed under M/462
- Examples:
  - EN 305 174 series: Broadband Deployment and Lifecycle Resource Management
    Part 1: Overview, common and generic aspects
    Part 2: ICT sites
    Part 5-4: Customer network infrastructures; Sub-part 4: Data centres (customers)
  - EN 300 200 series: Energy management; Operational infrastructures; Global KPIs
    Part 2: Specific requirements; Sub-part 1: ICT Sites
    Part 2: Specific requirements; Sub-part 2: Fixed broadband access networks
    Part 2: Specific requirements; Sub-part 3: Mobile access networks
    Part 3: ICT Sites - Sub-part 1: DCEM
    Part 4: Design assessments; Sub-part 4: Cable networks

Standardisation overview (3)

Operations and management

- System level – EN 50600-3-X
- Product level (examples)

  EN 303 470 (2019-03) Energy Efficiency measurement methodology and metrics for servers
  EN 303 471 (2019-01) Energy Efficiency measurement methodology and metrics for Network Function Virtualisation (NFV)
  ES 202 706-1 Metrics and Measurement Method for Energy Efficiency of Wireless Access Network Equipment
  Part 1: Power Consumption - Static Measurement Method (2017-01)
  Part 2: Energy Efficiency - dynamic measurement method (2018-11)

- Software

  project ISO/IEC 23544: Information Technology — Data centres — Application Platform Energy Effectiveness (APEE)

International Standardisation activities

ISO/IEC JTC 1/SC 38 Cloud Computing and Distributed Platforms

Scope
Standardization in the areas of Cloud Computing and Distributed Platforms including:

- Foundational concepts and technologies,
- Operational issues, and
- Interactions among Cloud Computing systems and with other distributed systems

15 publications e.g. on Reference Architecture, Open Virtualization Format (OVF), Interoperability and portability, Reference Architecture for Service Oriented Architecture (SOA RA)
see https://www.iso.org/committee/601355/x/catalogue/p/1/u/0/w/0/d/0

9 projects e.g. on Taxonomy based data handling for cloud services, Edge computing landscape, Cloud service metering and billing elements
see https://www.iso.org/committee/601355/x/catalogue/p/0/u/1/w/0/d/0

The way forward – a few recommendations

- EN 50600 has become **the** European reference for resource efficient design and operation of data centres
- Both public and private data centre operators shall base their operations on this framework
- As cloud computing comprises more than a physical data centre, we need
  - models and metrics, which allow for an analysis of the whole cloud computing eco-system w.r.t. resource efficiency (e.g. a fair evaluation of public cloud vs. private cloud, evaluation of resource efficiency of distributed services over multiple data centres)
  - technologies to provide resource efficient software, which minimizes resources for a given task, and suitable metrics to evaluate this
- The existing standardization results, in particular from ETSI, should be analysed to both determine the potential gaps in these documents and promote their use throughout Europe (also by non-European operators)

Conclusion

- European standardization has accepted the challenge of resource efficent deployment of ICT broadband facilities incl. data centres, i.e. cloud computing

- CENELEC and ETSI have already published a large set of ENs and other deliverables to support European policies and legislation relevant to energy efficiency in cloud computing; they continue to work on pertinent projects to reflect the state of the art in this important sector

- Input for European standardization work from the study on „Energy-efficient Cloud Computing Technologies and Policies for an Eco-friendly Cloud Market“ will foster the use of European Norms and thus contribute to an eco-friendly environment in the digital age

Thank you
for your attention!

We are building the e-dialistic future.
Please join us

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