Calculating Green IT savings: the EKT'sVirtual Infrastructure Green Meter (e-vigr)

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ABSTRACT

The **Ekt's - Virtual Infrastructure Green meter (e-vigr, [http://code.google.com/p/e-vigr/]**) is a set of scripts for estimating, in real time, using a set of qualified assumptions, the power savings a virtualization/cloud computing infrastructure achieves when compared to an equivalent non-virtualized infrastructure.

E-vigr applies **real time metering** of the actual power consumption of the virtual infrastructure's physical servers, **real time load measurements** from the running virtual servers and **qualified assumptions**, in order to estimate, in real time the following power, environmental and economic metrics:

1. the instantaneous power consumption benefits of the virtualized infrastructure in comparison to a equivalent physical one,

2. the cumulative energy consumption benefits of the virtualized infrastructure over a selected time period,

3. an estimation of the monetary power savings based on public available energy cost figures,

4. an estimation of the cumulative CO_2 emissions reduction over a selected time period based on public available figures,

5. the total power savings are estimated using a variety of PUE (Power Usage Effectiveness [**The Green Grid Data Center Power Efficiency Metrics: PUE and DCiE**, available at http://www.thegreengrid.org]) factors, or if available based on the actual's measured datacenter's PUE.

E-vigr can calculate power consumption savings of both **XEN** and **VMWARE** based virtual infrastructures. It requires the physical servers comprising the infrastructures to feature ILOM SNMP based power readings and it integrates nicely with Cacti for presentation purposes. The **e-vigr** set of scripts while not overly complicated encapsulate a set of valid and appropriate interdisciplinary assumptions in order to allow Datacenter and IT infrastructure managers to estimate and present power savings of virtualized and cloud infrastructures, thus making Green IT benefits immediately visible.

E-vigr, has being internally developed by the Hellenic National Documentation Centre (EKT/NHRF) and it is being made available as **Free/Open Source Software**. EKT/NHRF since 2007 has developed and operates a production grade virtualisation infrastructure that provides scientific documentation, online information and support services on research, science and technology on the Greek Academic community [**http:www.ekt.gr, www.openaccess.gr , etc.**]. EKT/NHRF has developed **e-vigr** in

order to monitor and assess this virtualization infrastructure benefits [**Real time actual graphs from EKT/NHRFs virtualization platform available at** :] and it is built extending previous work ["**Experience and quantitative results from the deployment of an open source production-grade virtualization platform**", available at http://helios-eie.ekt.gr/EIE/handle/10442/8140]["**The case study of an F/OSS virtualization platform deployment and quantitative results**" available at http://helios-eie.ekt.gr/EIE/handle/10442/8123] on estimating (in a static manner) the environmental and economic benefits of virtualization, especially open source. EKT/NHRF has made **e-vigr** available as Free Software, since it is showcase example of how an internally developed system can be augmented using external contributions and collaboration. Due to the nature of virtualized infrastructures the **e-vigr** tools are open-ended in order to be customized to various platforms and installations. E-vigr is currently on its first initial beta release (v0.5). Future work will aim to make the script more portable and customizeable, contributions from third parties are welcomed.

In the full paper the tool's internals and the assumptions [ITP Energy Matters: Fall 2008, **Five Ways to Reduce Data Center Server Power Consumption**, available at http://www1.eere.energy.gov/industry/bestpractices/energymatters/archives/fall2008.html, *reprinted from The Green Grid*],[**Sun Fire Server - Power Calculator**, available at http://www.sun.com/calc/servers/x64/x4150/index.html],[**http://www.greanpeace.gr**] made can be discussed in greater detail, and the future work plan and opportunities for extending this set of tools in a collaborative manner will be discussed.

REFERENCES

1. **http://code.google.com/p/e-vigr/**

2. **The Green Grid Data Center Power Efficiency Metrics: PUE and DCiE**, available at http://www.thegreengrid.org

3. **http:www.ekt.gr, www.openaccess.gr , etc.**

4. "**Experience and quantitative results from the deployment of an open source production-grade virtualization platform**", available at http://helios-eie.ekt.gr/EIE/handle/10442/8140

5. "**The case study of an F/OSS virtualization platform deployment and quantitative results**" available at http://helios-eie.ekt.gr/EIE/handle/10442/8123

6. **Real time actual graphs from EKT/NHRFs virtualization platform available at** :

   http://www.ekt.gr/power/vmpowerdaily.png

   - http://www.ekt.gr/power/vmtotalkwhweekly.png

   - http://www.ekt.gr/power/vmtotalco2weekly.png

   - http://www.ekt.gr/power/vmtotaleuroweekly.png

   - http://www.ekt.gr/power/vmtotalkwhdaily.png

7. ITP Energy Matters: Fall 2008, **Five Ways to Reduce Data Center Server Power Consumption**, available at http://www1.eere.energy.gov/industry/bestpractices/energymatters/archives/fall2008.html, *reprinted from The Green Grid*

8. **Sun Fire Server - Power Calculator**, available at
http://www.sun.com/calc/servers/x64/x4150/index.html

9. **http://www.greanpeace.gr**

CV notes of authors:

Dr. Panagiotis Stathopoulos is Head of Network and Systems Unit of the IT Systems Department of EKT/NHRF. He is leading the team developing and operating a sophisticated IT infrastructure providing services to the Greek Academic community. Dr. Panagiotis Stathopoulos received his diploma in Electrical and Computer Engineering and his PhD in Broadband Networks at 1999 and 2004 respectively, from the National Technical University of Athens (NTUA). He has been a senior research associate with the Computer Networks Laboratory of NTUA and he has participated in several IST and ICT research projects. He has taught at the University of the Aegean as an adjunct Lecturer, and he has over 30 publications in peer reviewed journals and conferences.

Mr. Alexandros Soumplis, MSc. received the Dipl.-Eng. degree of Informational and Communication Systems from the University of Aegean in 2003 and his MSc in Computer Communications in 2008. From 1999 until 2002 worked as support staff for the largest ISP in the country. In 2002 he became a Senior Systems Engineer in a major IT company and worked on various projects including high availability enviroments. Since 2007 he cooperates with the National Documentation Center as a Senior System Administrator. During this time he lead the migration of the existing infrastructure to a virtual infrastructure to serve the increasing needs within the organisation. Alexandros Soumplis is a Sun Certified Solaris System & Network Administrator (2002) and a RedHat Linux Certified Engineer (2007).