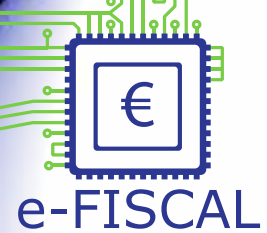


e-FISCAL Summer Workshop
Samos, 3 July 2012

Introducing the e-FISCAL project

Fotis Karagiannis,
Athens University of Economics and Business-Research Center
(AUEB-RC)



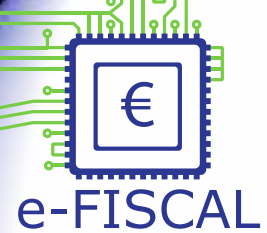


Outline

- Workshop objectives
- e-FISCAL project introduction
- High-level findings
- Some logistics...

Workshop objectives

- Present the initial findings of the project
 - State of the art
 - Surveying HPC/HTC centers and initial results
 - Benchmarking
- Get feedback from workshop participants
- **Create an open community of financial experts**
 - Contribute to the sustainability planning of the e-Infrastructures in the Horizon 2020 era and beyond
- Disseminate project results to the wider public

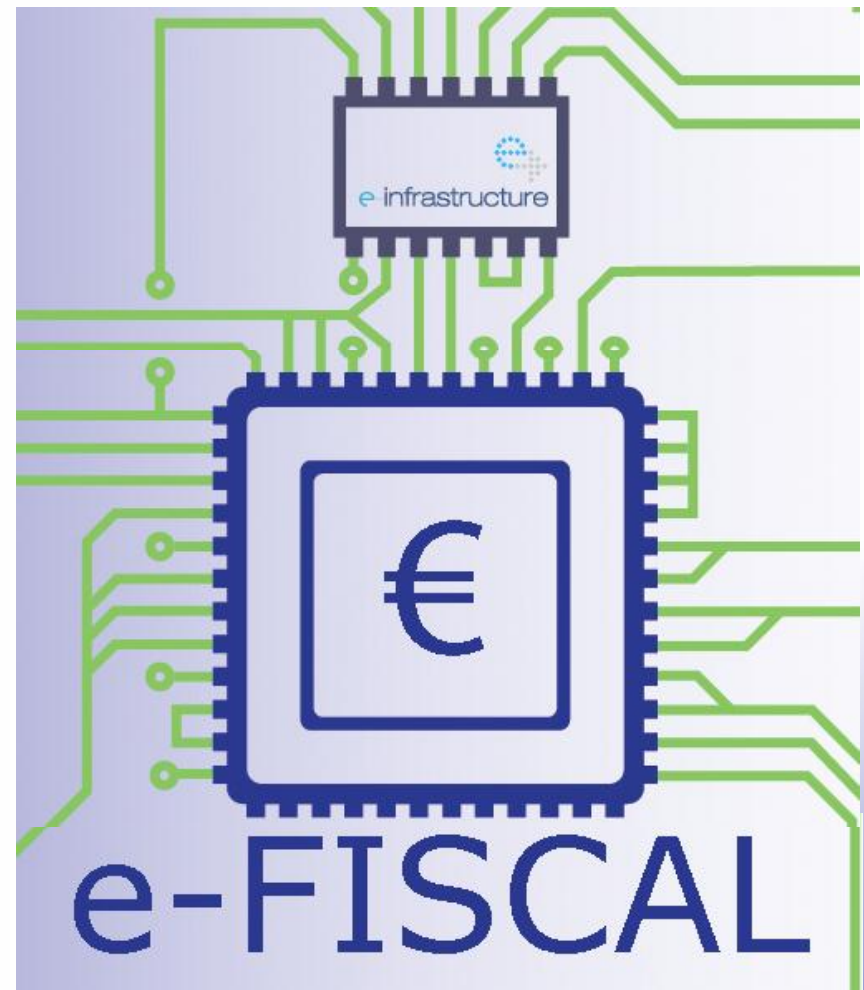


Financial Study for Sustainable Computing e-Infrastructures

It's all about
knowing the
costs..

...their
composition..

...and putting
them in context!



Main objectives

- **Analyse** the costs of the current European dedicated High Throughput and High Performance Computing (HTC/HPC) e-Infrastructures for research
- **Compare** them with the closest equivalent commercial leased or on-demand offerings
 - Cloud computing!
- **Evaluate** the findings through a report

Consortium



ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ 

AUEB-RC



European Grid Infrastructure

Towards a sustainable grid infrastructure

EGI.eu



NUIG*
(ICHEC)



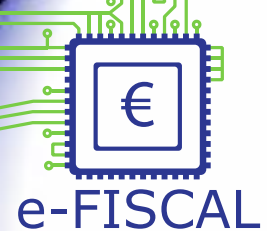
EMERGENCE TECH LTD.

ETL

* National University of Ireland, Galway / Irish Centre for High End Computing (ICHEC)

Background

- First *in-depth* study in Europe
 - Significant sample of participants, HTC/HPC,
 - Comparisons with Clouds
- Builds on previous “*e-IRGSP2 financial exercise*”
 - Dealt with HTC (Grids) only, small number of NGIs involved
 - Initial charting of the area
- e-IRGSP2 highlighted the complexity
 - Findings available at <http://goo.gl/L4nwA> (look at deliverable second part)
 - Large range for overall cost estimate
 - **Nevertheless** indicated EGI costs as competitive!



e-FISCAL key issues

- 2-phase approach
 - 1: Basic questionnaire
 - 2: In-depth discussions
- Survey closed Feb 2012 (www.efiscal.eu/survey)
 - Condensed survey: allow participation of centers that did not respond yet!
- Feedback received:
 - NGI/PRACE and other HPC/HTC site managers
- Contribute to e-Infrastructure sustainability discussions
- Sustainability of e-FISCAL?
 - EGI compendium, e-IRG Knowledge Base?

Caveats and Outputs

- Caveats:
 - Careful in comparing e-Infrastructure costs with Cloud prices!
 - Profit margin component of pricing
 - However in an actual use case such a comparison should be made
 - Confidentiality/Anonymity of data!
 - Cross-checks/validation with market or other prices
 - **No identifiable data related to an individual site or national HPC/HTC entity will be presented**
 - Inclusion of considerations beyond “plain” cost
 - Trust, reliability, customer satisfaction...
 - Cost is different from value!
- Outputs
 - Generic cost model
 - Cost per CPU core, Capex/Opex ratio, Personnel per CPU core...

Results so far

- State-of-the-art review <http://www.efiscal.eu/state-of-the-art>
 - Close to 40 papers reviewed
- Benchmarking efforts underway
 - Comparison of HPC infrastructures with Amazon
 - Comparison of HTC currently on-going
- Received 26 good quality answers from 14 countries
 - High-end HPC/HTC centres (e.g. PRACE Tier-0s or WLCG Tier-1s) not included
 - Confidentiality reasons, NDAs and “demanding questionnaires” cited
 - On-going discussions with EGI-InSPIRE and PRACE IP projects to get more info
 - PRACE is also working on TCO estimation of their centers

Initial cost findings..

- State-of-the-art review:
 - Prices for core/hour ranges from:
 - ~ € 0.015 (Magellan report) to ~ € 0.04 (University of Washington) in the US*;
 - ~ € 0.075 in the UK (Hawtin et al. 2012 for JISC)*
 - ~ € 0.09 for a sample of EGI centres in Europe (e-IRGSP2 in 2009)
 - e-FISCAL in-line with the rest of the studies:
 - Median € 0.05 in 2010 and € 0.0337 in 2011
 - Average: € 0.10 in 2010 and € 0.08 in 2011
- ➔ Centralised large HPC center personnel costs < distributed ones
 - *All the exchange rates are recent i.e. beg. of June 2012

More findings

- Observation and metrics...:
 - Significant **differences between median and averages**
 - Indicate outliers in the sample (low or high numbers) – to be studied!
 - **Costs decreasing** from 2010 to 2011
 - in-line with lower h/w prices and better efficiency
 - **CAPEX/OPEX ratio**: in 2011 around 30%-70% (median) to 32%-68% (average)
 - ~50-55% of total costs is dedicated to **personnel costs**
 - Average/median **utilization rate** for 2011: 58% & 67%
 - Mixture of EGI, PRACE and other sites
 - E.g. for 2011, EGI reports a utilisation rate of 71,3%.
 - **Depreciation rates** for computing: average 5 years
 - Quite good rates of **PUE**: 1.5 median value
 - Percentage of **electricity cost**: around 15% of all costs (median value)

Other considerations

- Amazon prices (market leader) range from:
 - On demand instance: ~€0,06
 - Multi-core/High memory ones: ~€ 0,08-0,1 per core
 - Smaller scale ones (micro) or 3 year reserved instance as low as ~€ 0,025
 - Supposing 100% utilisation...
- Vague separation between HPC and HTC systems
 - limited difference between near end-of-life HPC systems compared with newer high-end HTC ones
- Physical vs. logical core issue identified
 - Hyperthreading (in most cases): logical cores=2x physical cores

Logistics...

- **Tuesday afternoon (2-4pm and 4:30-6pm)**
 - e-FISCAL Summer Workshop – 1st day
- **Tuesday evening (8:00-11pm)**
 - Dinner
 - Buses leave at 7:00pm
- **Wednesday 4th of July morning – noon (9:30-11am and 11:30am-1pm) – SIVYLLA THEATER**
 - e-FISCAL Summer Workshop – 2nd day
- **Monday afternoon-Wednesday afternoon**
Interviews with survey respondents!

Thanks!

- All material to be available in www.efiscal.eu
- e-mail us at [info @ efiscal.eu](mailto:info@efiscal.eu) to and keep up with the project (update list)



Project in a nutshell

- **Project acronym:** e-FISCAL
- **Contract n° :** RI-283449
- **Project type:** CSA-SA
- **Start date:** 01/08/2011
- **Duration:** 18 months (end 31/1/2013)
- **Total budget:** 392.523 €
- **Funding from the EC:** 349 999 €
- **Total funded effort in PMs:** 33.75
- **Web site:** www.efiscal.eu