

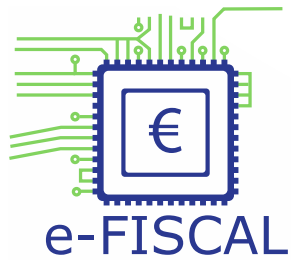
**e-FISCAL Final Workshop Panel
Amsterdam, 29 January 2013**

**e-FISCAL: Sustainability and Business models -
Lessons Learned and Way Forward**

Fotis Karagiannis

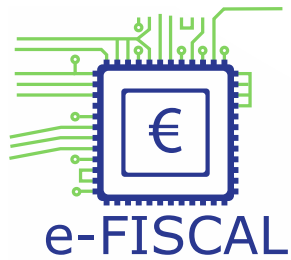
Athens University of Economics and Business-Research Center (AUEB-RC)

Evolving EGI Workshop and co-located e-FISCAL Workshop



e-FISCAL outputs

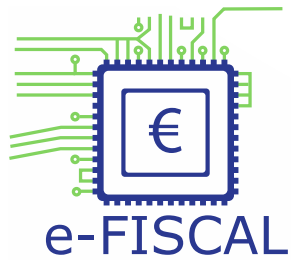
- Pioneer costing federated computing e-Infrastructures
 - in a highly distributed-heterogeneous environment!
- Estimation of several metrics
 - € per core hour, CAPEX/OPEX ratio, depreciation rates, cost distribution, electricity/PUE, ...
- Comparisons with Clouds – Amazon EC2
- State-of-the-art review (46 articles)
- Hybrid methodology - Cost structures
 - Questionnaire: 28 high quality answers from 16 countries
- Benchmarking efforts (HPC/HTC vs. Amazon EC2)



e-FISCAL outputs(2)

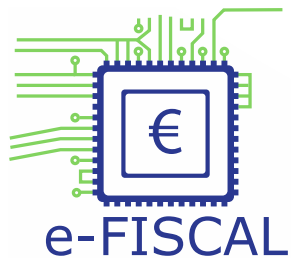
- Appreciation of cost aspects: Nothing is free!
- Understanding of e-Infrastructure cost ranges
- Self-assessment tools www.efiscal.eu/tools
 - Excel based
 - On-line version
- 4 e-FISCAL workshops
 - Lyon, Samos, Prague, Asterdam
- e-FISCAL outreach → community
 - ~50 financial and overall 150 experts in ~ a year



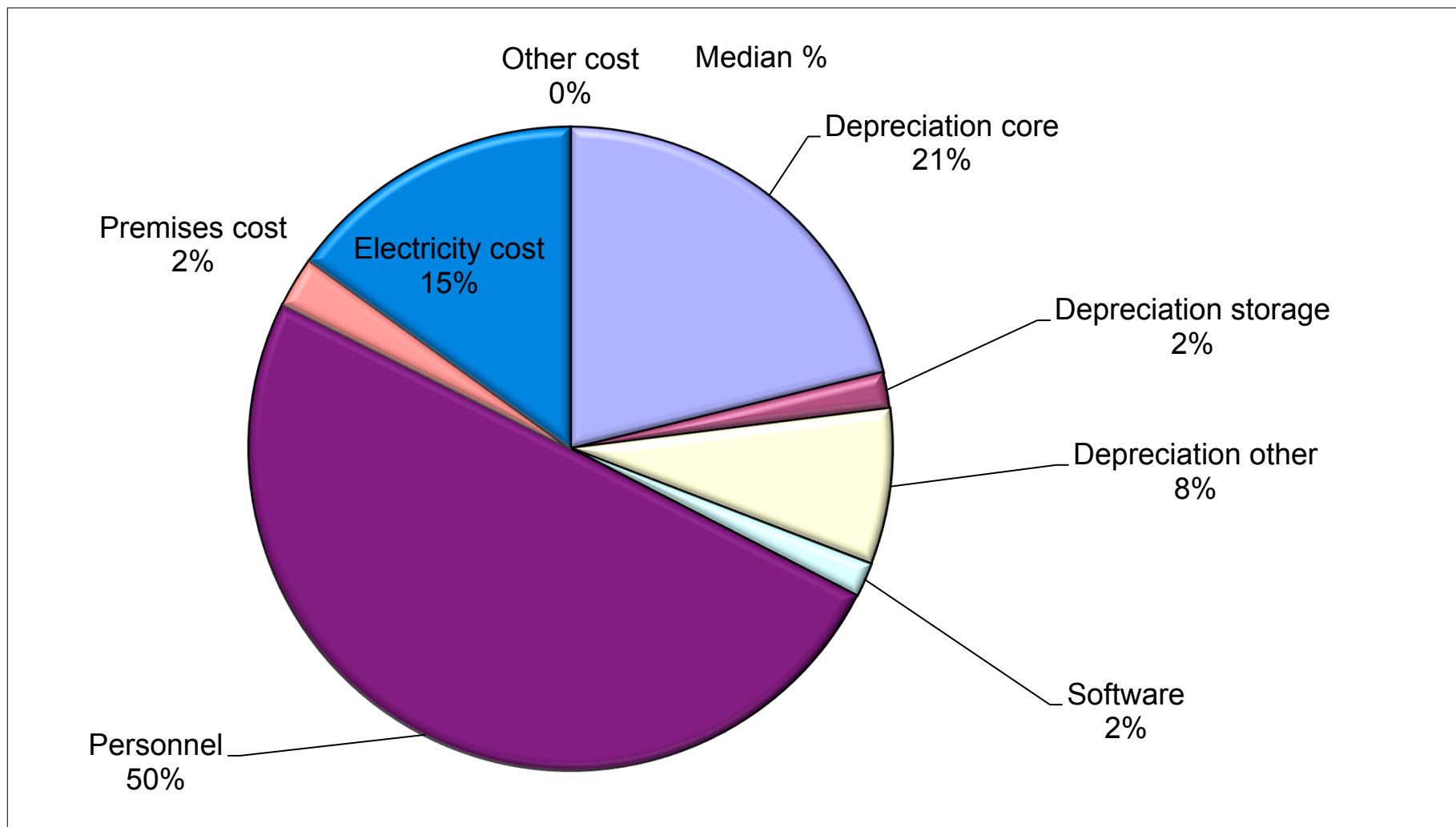


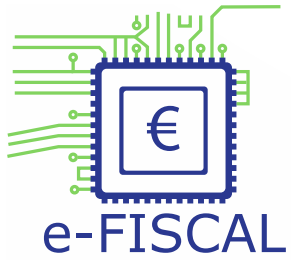
e-FISCAL main findings

- In-house HPC/HTC e-Infrastructures are cost-effective
 - With the high utilisation rates (75%) & depreciation rates (5 years)
 - Cost per core hour in € in 2011: 0,072 avg. - 0,031 median
 - However per application cost analysis is needed
- Personnel ~50% of total costs; CAPEX/OPEX=30/70%
 - Average salary ~50K, PUE~1,5
- Larger sites have in general less FTEs/core
- Small-scale benchmarking efforts between in-house HPC and Amazon Compute Cluster instance:
 - A ~40% performance degradation
- Modest size HPC centres similar to state-of-the-art HTC ones



Costs breakdown (2011-median)



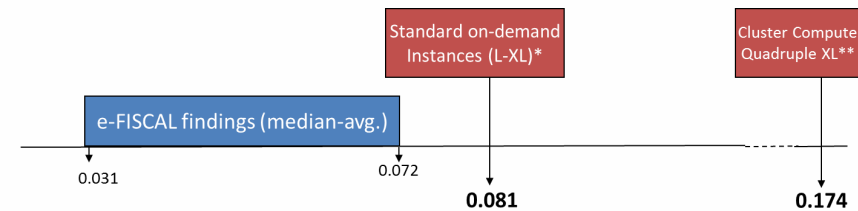


Comparison with Amazon

PERFORMANCE DEGRADATION INCLUDED

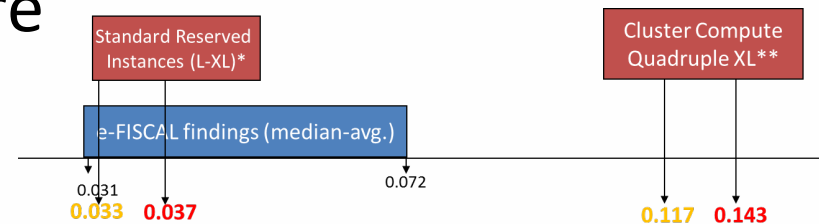
- EC2 “on-demand” instances always more expensive

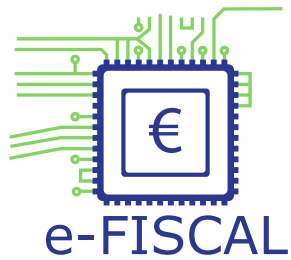
- Even standard ones



- “Reserved” instances much more competitive

- However EC2 “cluster compute” (HPC in the cloud) > 1,5-2 times more

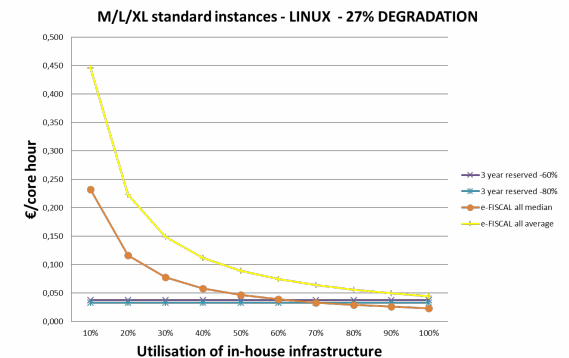


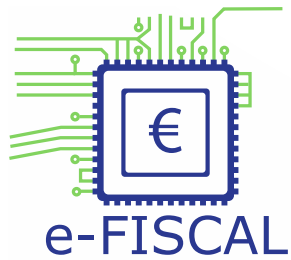


In-house utilization above which it is better to keep it in-house...

PERFORMANCE DEGRADATION INCLUDED

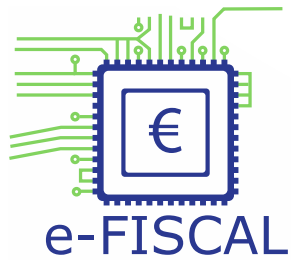
- Again variation among the different instances:
 - >30-55% compared to EC2 “standard **on-demand**” instances
 - 15-27% compared to “cluster compute”
 - 40-90% compared to “standard **reserved** ones”
 - 18-40% for reserved “cluster compute”





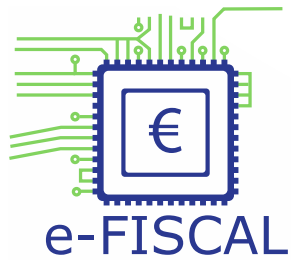
e-FISCAL sustainability

- The tools will remain available on the website
- State of the art repository also
- LinkedIn group on ICT cost assessment
[linkd.in/VqEth0](https://www.linkedin.com/company/e-fiscal) continues discussions
- Cost collection/estimation to continue in part through the EGI compendium (
go.egi.eu/EGI-Compendium-2011)
- Consortium members can provide consultancy



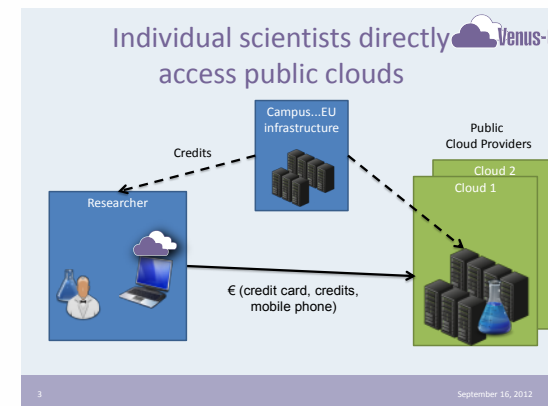
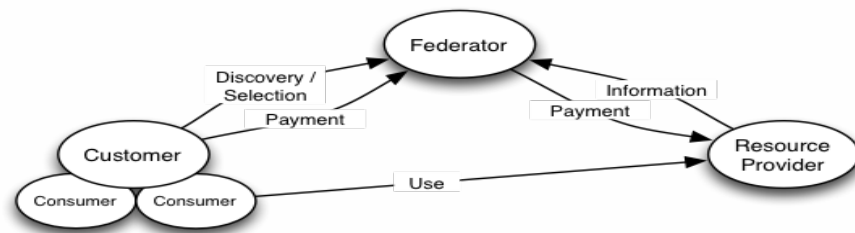
Lessons learned

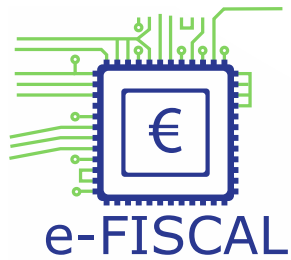
- Not trivial gathering-estimating costs in a highly heterogeneous-federated environment!
 - Anonymity, confidentiality, overload, ..
- And comparing with cloud prices
 - profit-margin, like-with-like comparisons -performance...
- Cost \neq price and cost \neq value
- Moving the cloud a different exercise
 - Focus on avoidable costs – some evidence that personnel costs want decrease so much
- e-FISCAL with cost know-how acts as a consultant for policy makers and strategists



Business models

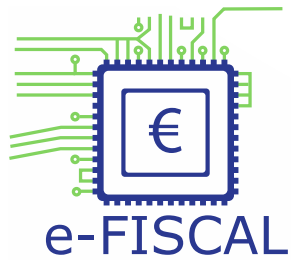
- High utilization key to maintain economic efficiency
- A broker role is essential to facilitate demand meeting the right suppliers
- Need to evolve funding streams and new pricing models





Way forward is...open!

- Probably a mix of several e-infrastructure service components
 - In-house HPC/HTC, Hybrid clouds: In-house Cloud+ Commercial HTC/HPC clouds, networking, data,...
 - Service-Oriented e-Infrastructure (SOI) to provide e-Science as a Service....
- Efficient integration will be key for researchers accessing one-stop-shop services by 2020
 - Again broker role important!
 - Again need to evolve funding streams and pricing models!



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 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

