

PCOG Yearly Team Meeting 2015 Edition



Short CV

- 35 years old, French, married (2004)
 - ✓ 2 children (Adrien 2007, Chloé 2010)
- PhD in 2007
 - ✓ Security in Large Scale Distributed Systems:
Authentication and Result Checking
- Github, CoD, UrT, FIFA : Falkor
- In PCOG since 2007
 - ✓ Security / Evaluation of Distributed Computing Platforms (HPC, cloud...)
 - ✓ UL HPC Manager with Pascal



■ Projects:

- ✓ COST: Network for Sustainable Ultrascale Computing (NESUS)
- ✓ GORE, POLLUX, UL (HPC, Evoperf)

■ Collaboration / Supervision:

- ✓ [HPC] Sysadmin Team: Hyacinthe, Valentin & Sarah
- ✓ PostDoc:
 - Joseph (HPC workload analysis)
- ✓ PhD.
 - Jakub: Cheating-Tolerance of EAs in DGVCS
 - Alumni: Ben
- ✓ Master
 - Maxime (until August): RESIF / eTricks OpenStack

Management / Supervision

■ Projects:

- ✓ COST: Network for Sustainable Ultrascale Computing (NESUS)
- ✓ GORE, POLLUX, UL (HPC, Evoperf)

■ Collaboration / Supervision:

- ✓ [HPC] Sysadmin Team: Hyacinthe, Valentin & Sarah
- ✓ PostDoc:
 - Joseph (HPC workload analysis), **Jakub** (wake-on-lan optim?)
- ✓ PhD.
 - ~~Jakub: Cheating Tolerance of EAs in DGVCS~~
 - Alumni: Ben, **Jakub**
- ✓ Master
 - Maxime (until August): RESIF / eTricks OpenStack



UL HPC Management

High Performance Computing (HPC) @ UL





HPC @ Uni.lu

Chaos, Gaia, Nyx and Granduc clusters

Get Updates: ☐ By RSS ☐ On Twitter

Home Systems For Users Live Status HPC School Blog/News About

Search...

Welcome to the HPC @ Uni.lu platform !

This is the official website of HPC @ Uni.lu platform, which assembles information about the computing clusters operated by the University of Luxembourg and the organization running them.

The country that out-computes will be the one that out-competes.
— The Council on Competitiveness



Server room @ Belval
This picture corresponds to the server room in the LCSB building @ Belval, hosting the **Gaia** cluster. The violet lights come from the Nexsan disk enclosures.

Featured Systems

We currently operate a total of 446 computing nodes (4788 cores, 68.723 TFlops) and a shared storage capacity of 3025.4 TB (+ 1516 TB for backup).

Platform Status

Several tools report in live the current status of our systems. [Check them out!](#)

Latest News

Get the latest news / advertisements linked to the UL HPC platform in this [page](#).

User Docs

We took the time to make the [HPC documentation](#) as complete as possible. Please make sure you read it carefully.

Publications

Collect the publications [related to the UL HPC platform](#) or made by the researchers thanks to it.

Management Team

Discover [who's behind the platform](#) and ensure that it is running correctly.

Recent Posts

- UL HPC Platform @ CSC away day
- UL HPC School 2015 - Keynotes slides
- Introduction to Git and Vagrant
- SMAI 2015 Congress - Keynote slides
- Create a Centos7 domU on a Debian7 dom0

GitHub Repos

tutorials launcher-scripts modules qualif dotfiles ...

Tweets

[Follow](#)

ULHPC @ULHPC 30 Jun
Keynote slides introducing @gitscm and @vagrantup at the @ULHPC School 2015 (including LaTeX Beamer Sources): hpc.uni.lu/blog/2015/intr...
Expand

ULHPC @ULHPC 30 Jun
The main keynotes of the latest @ULHPC School 2015 are available here: hpc.uni.lu/blog/2015/ul-h...

ULHPC @ULHPC 30 Jun
Find our latest @ULHPC tutorials online: ulhpc-tutorials.readthedocs.org
Expand

ULHPC @ULHPC 25 Jun
Sebastien Varrette (@svarrette) opens the 2015 HPC School @uni.lu ! pic.twitter.com/oqFcl9k9w9

Tweet to @ULHPC

<http://hpc.uni.lu>

- 344 users
- 72 servers
- 446 nodes
- ✓ 3788 cores
- 4 sysadmins

UL HPC Platform: Sites/Data centers



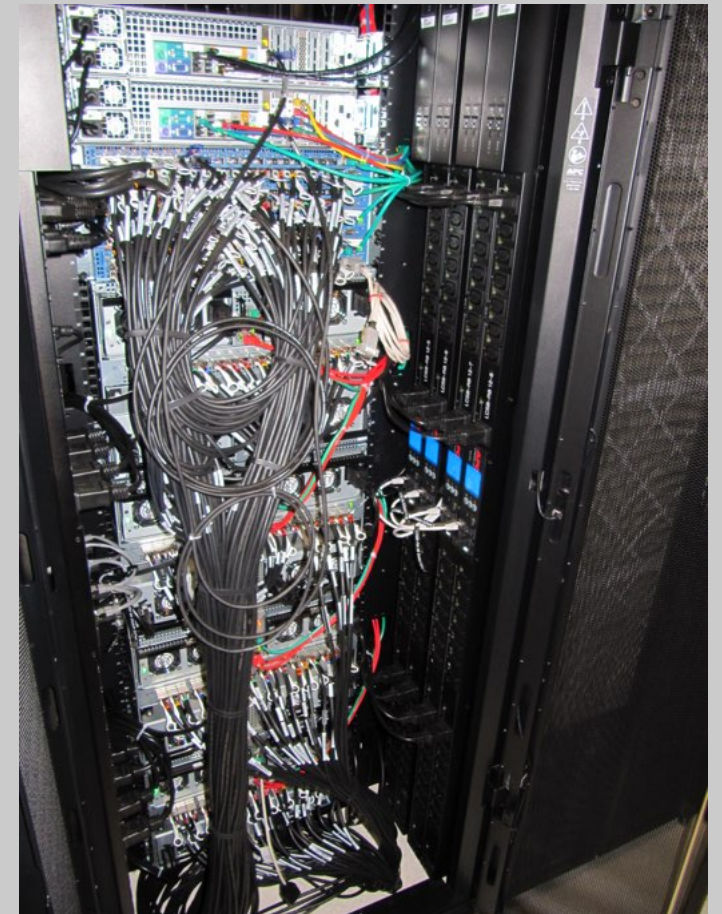
Kirchberg
(CS.43, AS 28)



Belval
(Biotech I, CDC/Maison du Savoir)

2 sites /
 ≥ 4 server rooms

UL HPC Platform: Computing capacity



4 clusters
69 TFlops
446 nodes
4788 CPU cores
24512 GPU cores



UL HPC Platform: Storage capacity



4 distributed/parallel FS
1 558 disks
3.025 PB + 1.516 PB (Backup)

UL HPC Platform : HR Capacity



2 managers
4 sysadmins
2 oracles



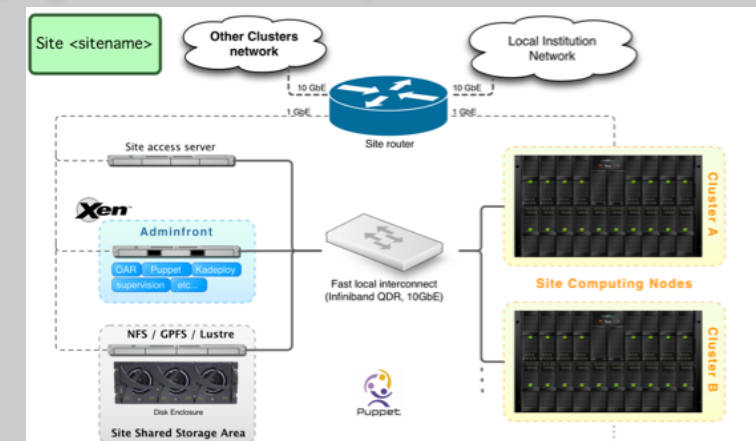
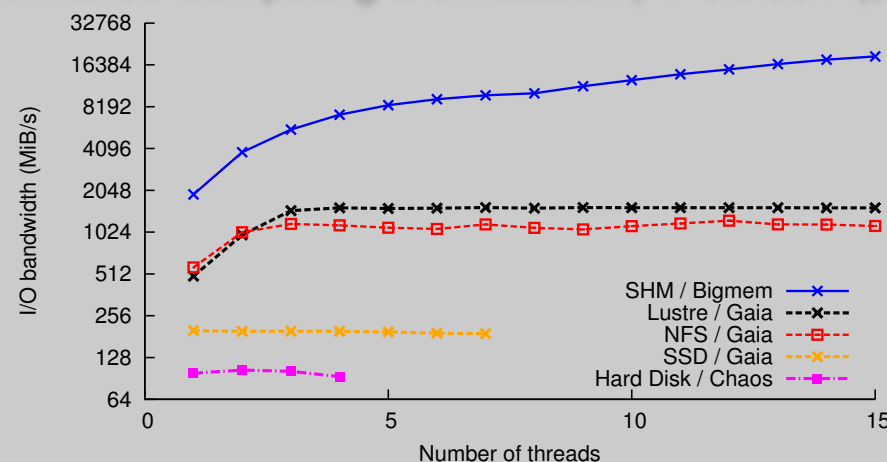
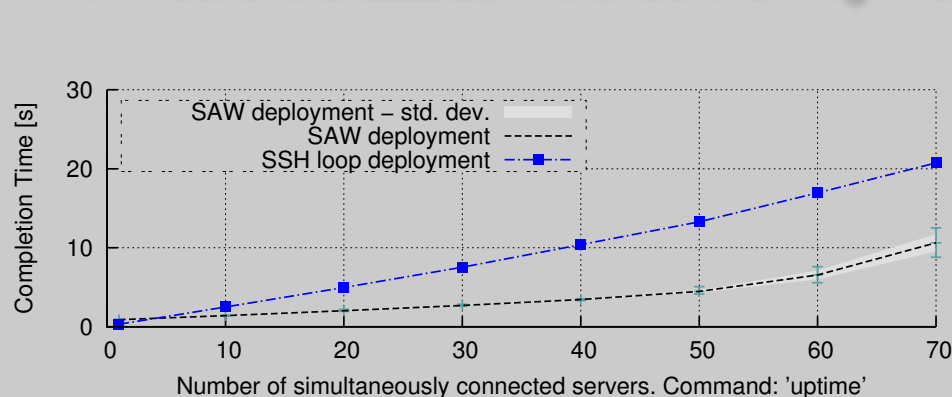
UL HPC in your publications

■ Per UL HPC User charter

✓ official acknowledgement to place in your article

✓ reference publication so far:

[HPCS'14] S. Varrette, P. Bouvry, H. Cartiaux, and F. Georgatos. *Management of an Academic HPC Cluster: The UL Experience*. In Proc. of the IEEE 2014 Intl. Conf. on High Performance Computing & Simulation (HPCS 2014), pages 959–967, July 2014.



✓ Add 'ULHPC' Tag to your Orbi^{Lu} publications

Public comments : **Research centre**
Full name of the research centre. Please do not use any abbreviations unless these are the centre's most frequent name. Enter at least 3 letters to receive suggestions from the list of most frequent research centres.
Example:
• Centre de Recherche Public Gabriel Lippmann

Funders :

Research centre :

Research project name :

UL HPC Complementary IT Services

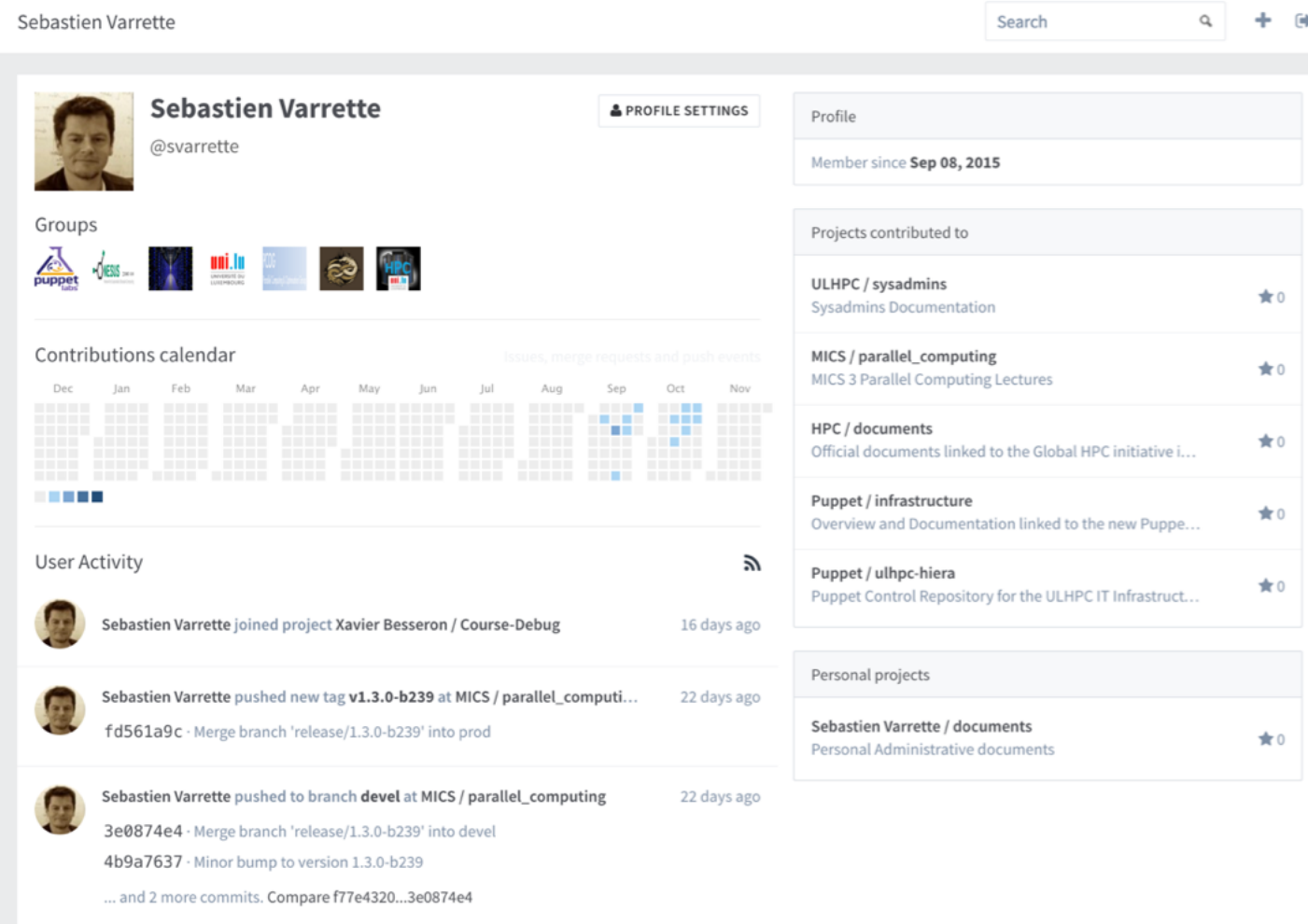
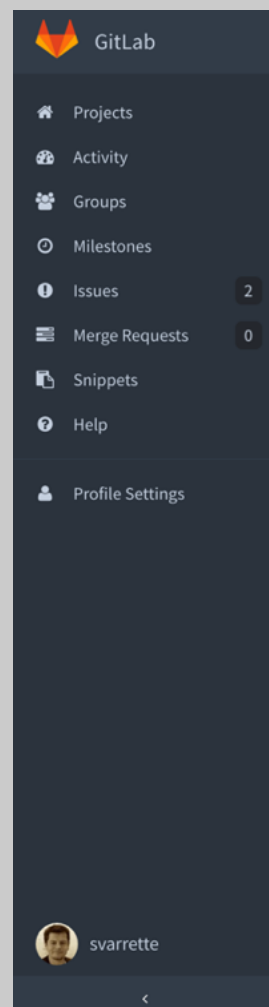
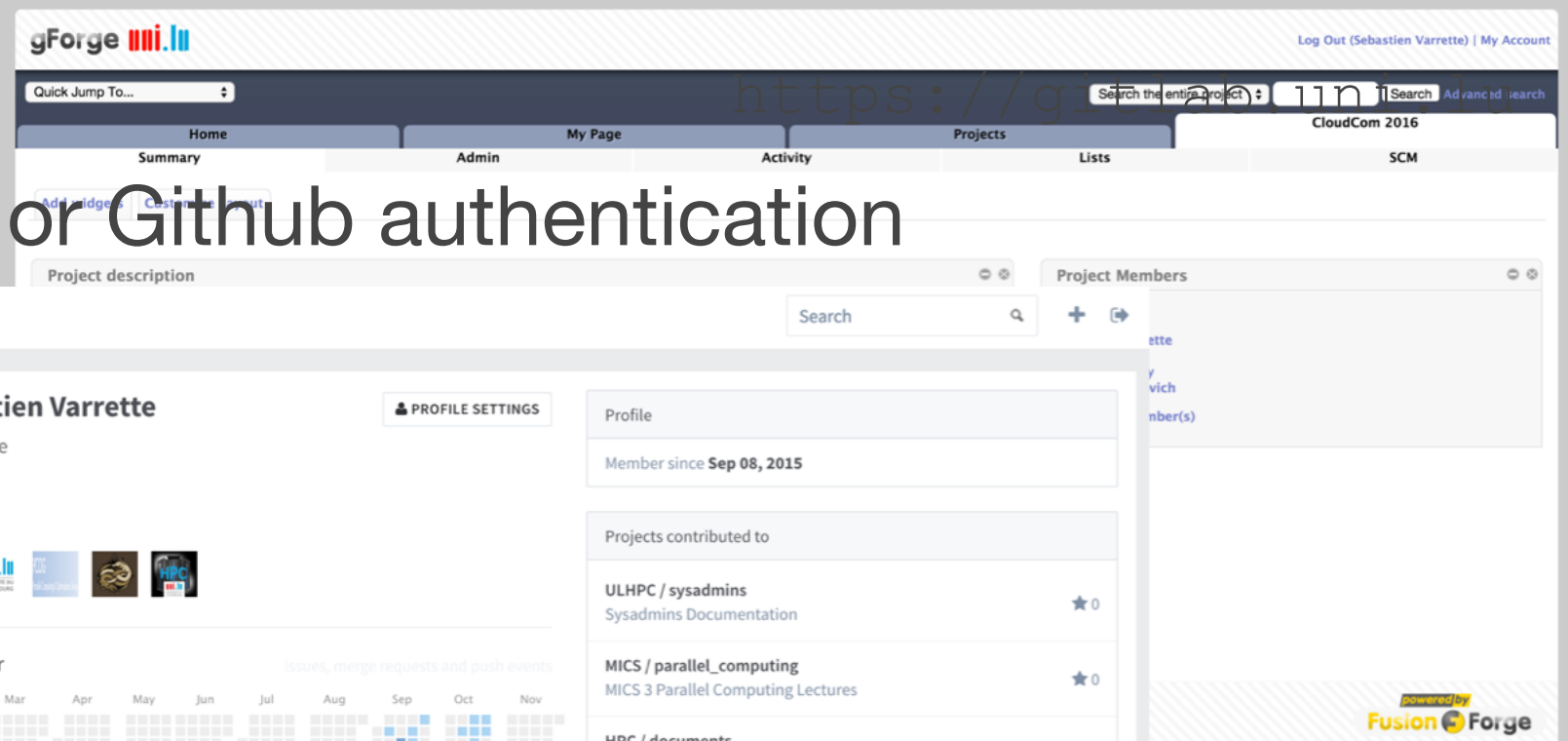


- Collaborative Tools: Gforge @ UL <https://gforge.uni.lu>

✓ 330 projects / 433 users

- NEW: Gitlab @ UL

✓ ULHPC credentials or Github authentication



Research Activities / Recent Publications

Books / Coding Theory

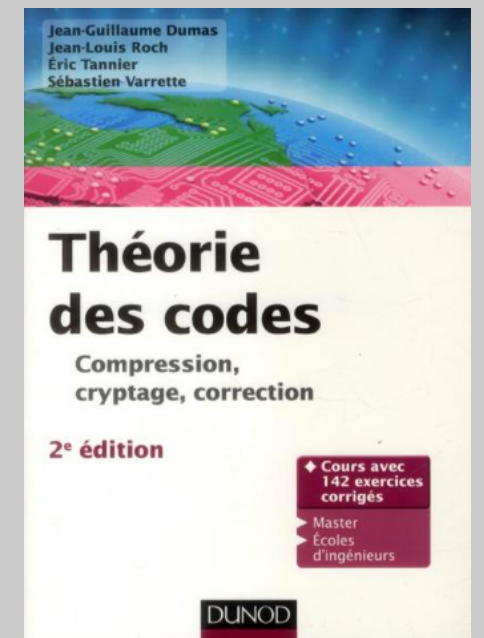
■ Théorie des codes (In french, Dunod)

✓ 2nd edition

✓ compression, crypto, error correction

[TdC'14] J.-G. Dumas, J.-L. Roch, E. Tannier, and S. Varrette. ***Théorie des Codes : Compression, Cryptage et Correction***.

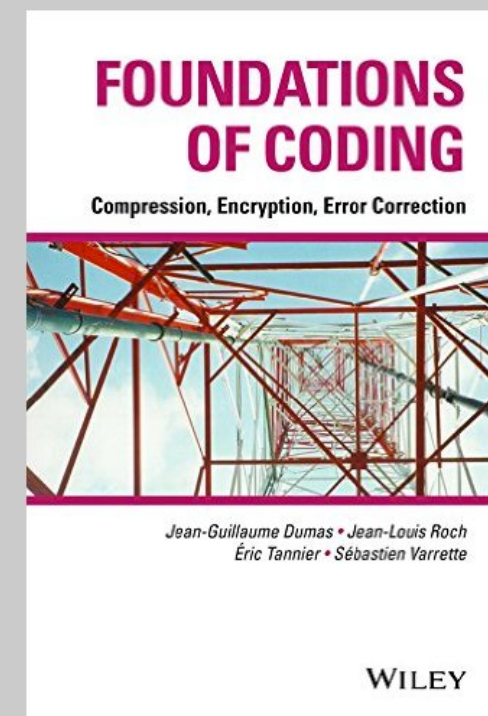
Collection Sciences Sup. Dunod, 2nd edition, Mars 2014. 384 pages.



■ (new) english translation: **Foundation of Coding**

✓ compression, crypto, error correction

[FoC'15] J.-G. Dumas, J.-L. Roch, E. Tannier, and S. Varrette. ***Foundations of Coding: Compression, Encryption, Error- Correction***. Wiley & Sons, Feb 2015. 376 pages

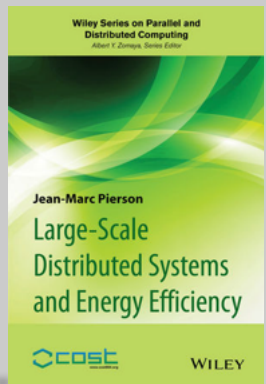


Sustainability in Ultra-Scale Computing

■ COST IC0804 contribution

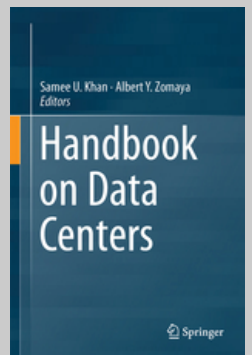
✓ Energy Efficiency and HPC SotA

[IC0804] P. Bouvry, G. L. T. Chetsa, G. Da Costa, E. Jeannot, L. Lefèvre, J.-M. Pierson, F. Pinel, P. Stolf, and S. Varrette. **Large-scale Distributed Systems and Energy Efficiency: A Holistic View**, volume 94 of Wiley Series on Parallel and Distributed Computing, **chapter Energy Efficiency and High-Performance Computing**, pages 197–224. John Wiley & Sons, Feb 2015



■ Handbook on Data Center

[HDC_ch3] S. Varrette, P. Bouvry, M. Jarus, and A. Oleksiak. **Handbook on Data Centers, chapter Energy efficiency in HPC Data Centers: Latest Advances to Build the Path to Exascale**. Springer, Feb 2015.



■ COST IC1305 Contributions

✓ WG3: Resilience of applications & runtime env.

✓ WG5: Energy Efficiency

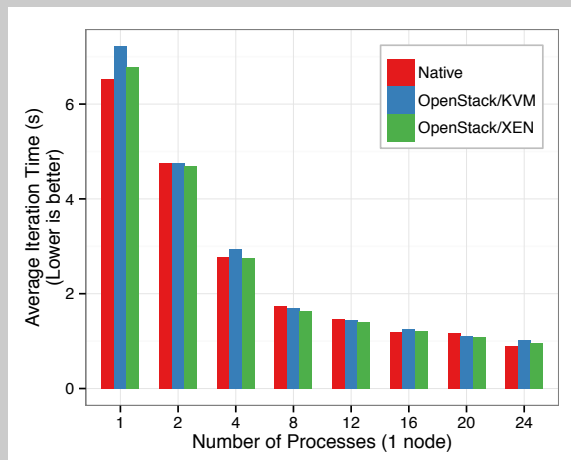
[SFRI15] P. Bouvry, R. Mayer, J. Muszynski, D. Petcu, A. Rauber, G. Tempesti, T. Trinh, and S. Varrette. **Resilience within Ultrascale Computing System: Challenges and Opportunities from Nesus Project**. M. Bagein, J. Barbosa, V. Blanco, I. Brandic, S. Cremer, S. Fremal, H. Karatza, L. Lefevre, T. Mastelic, A. Oleksiak, A.-C. Orgerie, G.L. Stavrinides, and S. Varrette. **Energy Efficiency for Ultrascale Systems: Challenges and Trends from Nesus Project**. Intl. J. on Supercomputing Frontiers and Innovations, 2(2):46–63, 2015.



Performance Evaluation of Computing Systems

■ [Energy] Performance of HPC Workloads [Val, Xav, Mat]

✓ over new computing env. (Cloud, ARM clusters etc.)



[Pareng15] X. Besseron, V. Plugaru, A. H. Mahmoudi, S. Varrette, B. Peters, and P. Bouvry. *Performance Evaluation of the XDEM framework on the OpenStack Cloud Computing Middleware*. In PARENG 2015, Mar. 2015.

	Avg. Performance drop				Avg. Energy-efficiency drop	
	HPL	STREAM	RandomAccess	Graph500	Green500	GreenGraph500
OpenStack+Xen	41.5%	19%	89.7%	21.6%	56.5%	42%
OpenStack+KVM	58.6%	7.2%	67.5%	23.7%	38.5%	40%

[ICPP'14] S. Varrette, V. Plugaru, M. Guzek, X. Besseron, and P. Bouvry. *HPC Performance and Energy-Efficiency of the OpenStack Cloud Middleware*. In ICPP-2014, HUCAA'14 workshop, 2014.

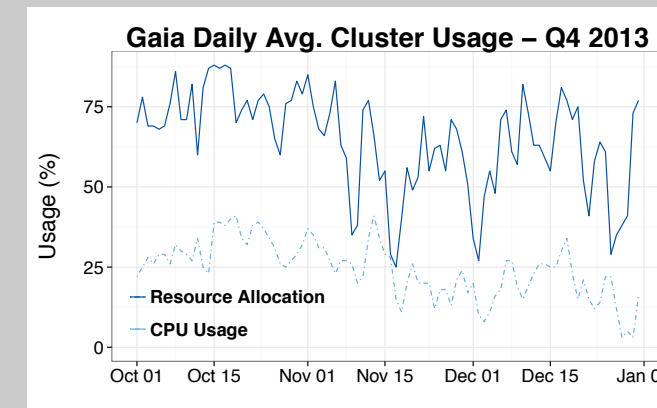
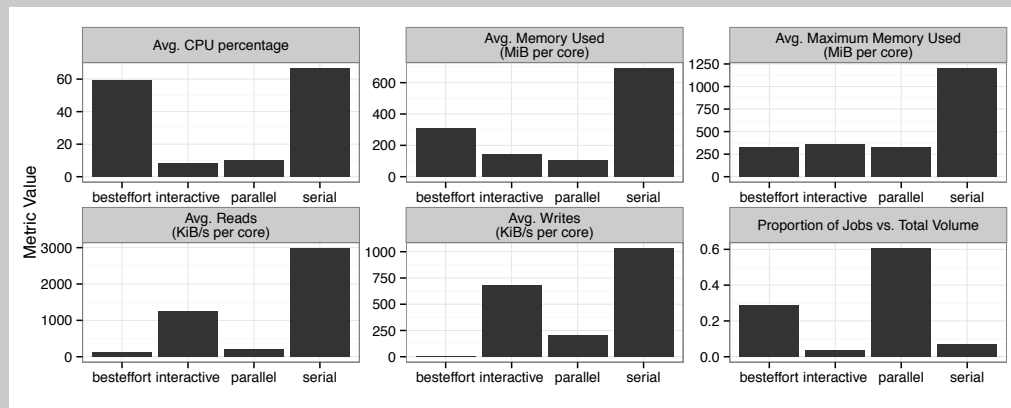
Configuration	PpW	G500 Rank
Viridis Baseline	513.53 MFlops/W	204
Viridis OpenStack/LXC 1VM/host	371.76 MFlops/W	234
Viridis OpenStack/LXC 2VM/host	333.94 MFlops/W	239

[CloudCom'14] V. Plugaru, S. Varrette, and P. Bouvry. *Performance Analysis of Cloud Environments on Top of Energy-Efficient Platforms Featuring Low Power Processors*. In IEEE CloudCom'14, Singapore, Dec. 15–18 2014.

Performance Evaluation of Computing Systems

■ UL HPC Jobs/Usage Analysis: Evalix

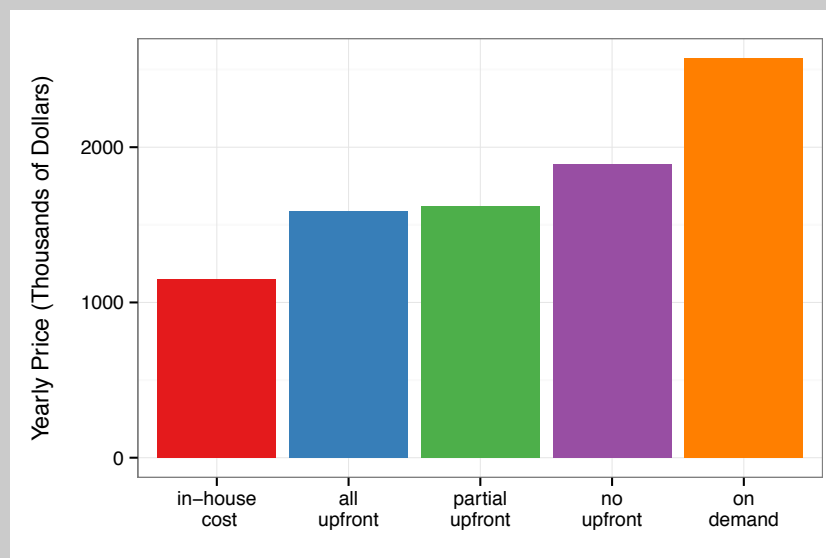
[Jo,Mat]



[JSSPP15] J. Emeras, S. Varrette, M. Guzek, and P. Bouvry. *Evalix: Classification and Prediction of Job Resource Consumption on HPC Platforms*. In JSSPP'15, part of IEEE IPDPS 2015), Hyderabad, India, May 25–29 2015.

■ Cost analysis: Cloud HPC vs. in-house HPC

[Jo,Val]

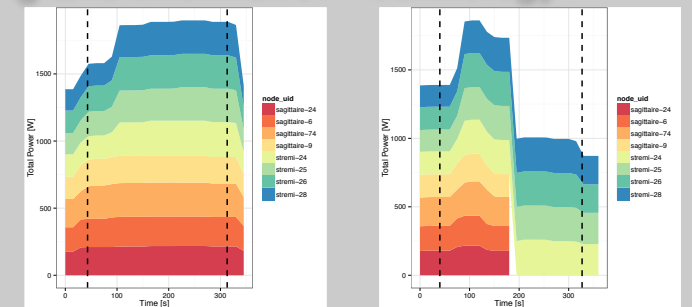


Generation of Energy-aware {middle|soft}ware

■ MAS for energy aware executions

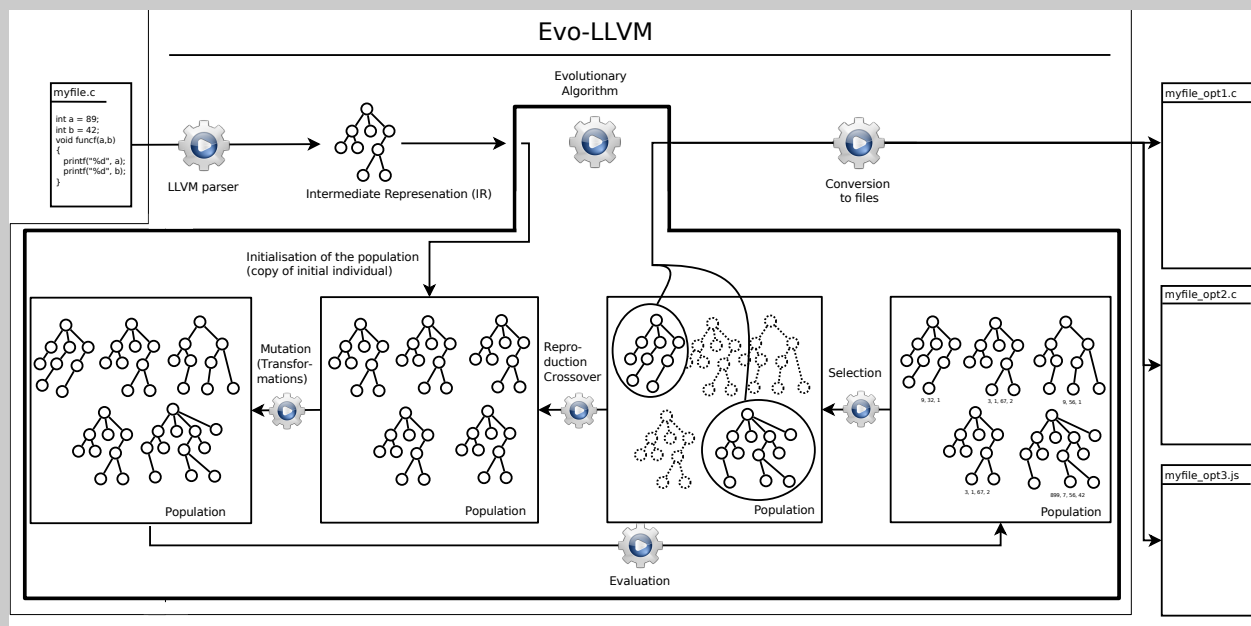
[Mat,Xav,Greg]

[ISSPIT'14] M. Guzek, X. Besseron, S. Varrette, G. Danoy, and P. Bouvry. **ParaMASK: a Multi-Agent System for the Efficient and Dynamic Adaptation of HPC Workloads.** In Proc. of the 14th IEEE Intl. Symp. on Signal Processing and Information Technology (ISSPIT'14), Noida, India, Dec. 2014. IEEE Computer Society



■ LLVM optimization to produce green code

[Bernie]



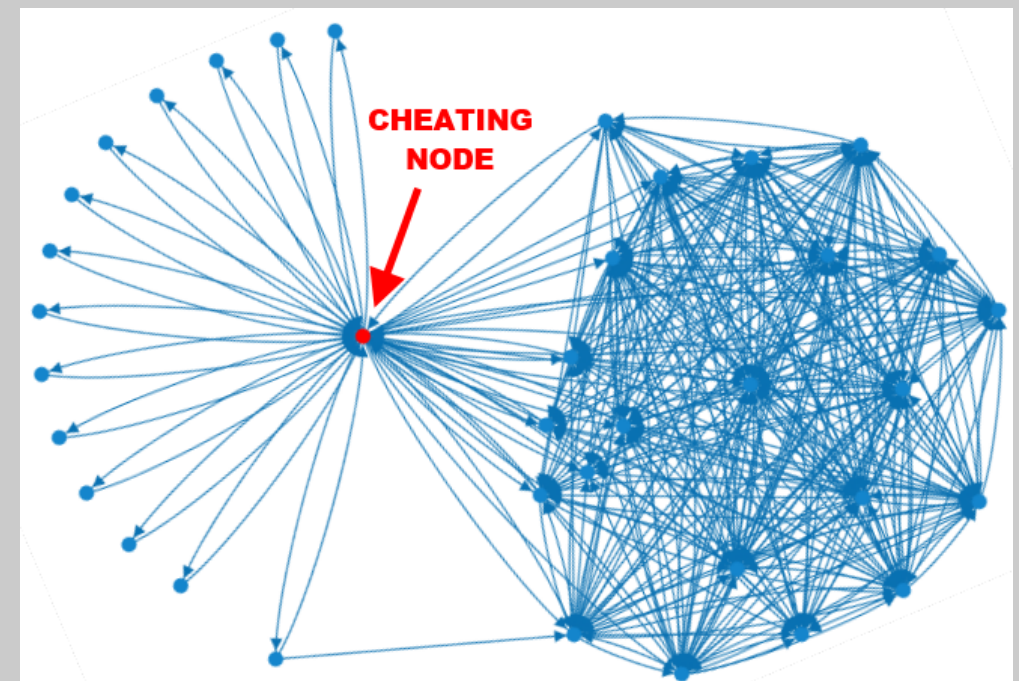
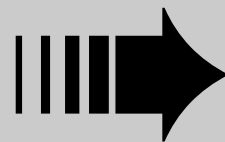
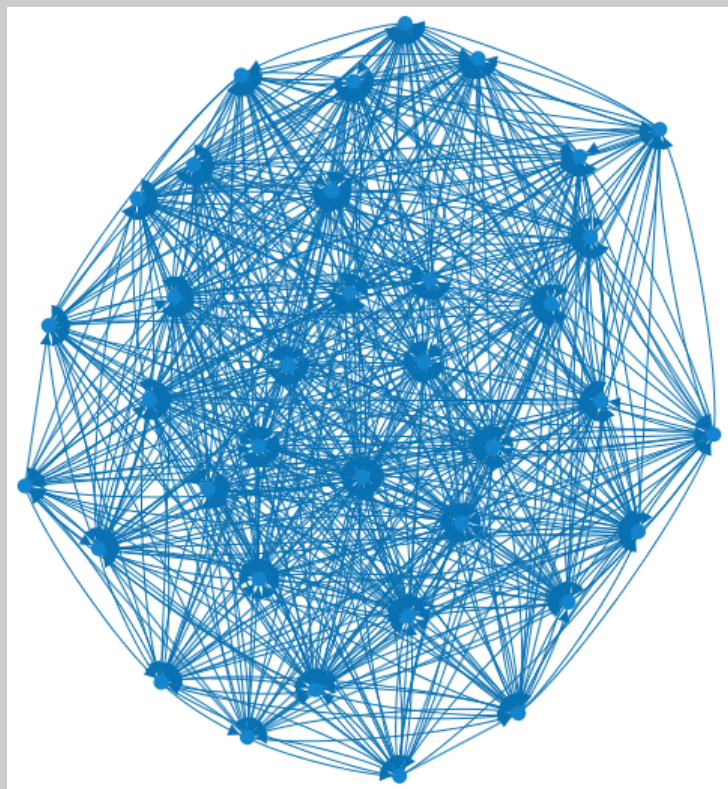
[ESCIM'15] S. Varrette, Bernabe Dorronsorro, and P. Bouvry. **An LLVM-based Approach to Generate Energy Aware Code by means of MOEAs.** In ESCIM 2015, Oct 2015.

Cheating-Tolerance over DGVCS

- [Breaking the] Resilience of Newscast protocol [Jakub]
- dCEA analysis in the presence of such faults

[NIDISC15] J. Muszynski, S. Varrette, B. Dorronsor, and P. Bouvry. ***Distributed Cellular Evolutionary Algorithms in a Byzantine Environment***. In NIDISC 2015, part of the 29th IEEE/ACM IPDPS 2015, May 25–29 2015.

[NSS'14] J. Muszynski, S. Varrette, J.L. Jimenez Laredo, and P. Bouvry. **Exploiting the Hard-wired Vulnerabilities of Newscast via Connectivity-splitting Attack**. In Proc. of the IEEE Intl. Conf. on Network and System Security (NSS 2014), volume 8792 of LNCS, pages 152–165, Xi'an, China, Oct 2014. Springer Verlag. ***Best Student Paper Award***.



Incoming [2016] Milestones

- [UL] HPC IPCEI
 - ✓ CDC S-02 developments
- Moving to Belval!
- Incoming Events:
 - ✓ NIDISC'16, May 23-27, 2016
 - ✓ IEEE CloudCom'16, Dec 12-15, 2016
- Ski, Karting, LaserGame...



Conclusion

Thanks for your attention!
