Master SCCI 10th Birthday

http://10ans-scci.imag.fr

Sebastien Varrette, PhD, SCCI'03

UNIVERSITÉ DU LUXEMBOURG

Grenoble, September 12th, 2011

Short CV

- 31 years old, married (2004), 2 children (2007,2010)
- 1997-2000: Advanced mathematics & physics studies
  - Lycee Victor Hugo (Besançon, 25)
- 2003: Master's degree in engineering with honours (B/2.1)
  - **Telecom dept. ENSERG/ENSIMAG** (INP Grenoble, 38)
- 2003: Master's degree with honours (TB/First Class)
  - Cryptology, Security & Information Coding (**CSCI**)
  - UJF/INP Grenoble, 38

Short CV

- 2003: **System Administrator** (ID-IMAG Lab)
- 2004-2007: **Ph.D** in computer science with honours (UL)(Excellent)

Security in Large Scale Distributed Systems: Authentication and Result Checking.

- Joint PHD University of Luxembourg / INPG
- Advisors: J-L Roch (INPG), F. Leprévost (UL)
  - Design of the authentication system of Grid5000
  - Probabilistic certification of distributed executions against massive attacks

Short CV

- Since 2007: **Scientific Collaborator** at UL
  - Manager of UL's HPC (High Performance Computing) platforms
    - `chaos` cluster: 656 compting cores, 25TB, **6.13 TFlops**
    - `lux5000` cluster: 176 computing cores, 2TB, **1.4 TFlops**
    - `gaia` cluster: 744 computing cores, 2x240TB, **6.34 TFlops**
    - Main management tools: FAI, Puppet, git, OAR, OpenLDAP
  - Research activities
    - Main research area: security of distributed computing platforms
    - PhD student supervision: B. Bertholon, J. Muszynski

Research: Cloud security

- **Checkable Signature of Distributed Execution Flow**
  - Static (offline) code signature generation (NFA)
  - Dynamic (online) DFG verification by execution agents

[SiiS'11] B. Bertholon, S. Varrette, and P. Bouvry. A Signature Scheme for Distributed Executions based on Control flow Analysis. In 19th Intl. conference on Security and Intelligent Information Systems (SIIS 2011), Springer LNCS 7053, Warsaw, Poland, June 2011

- **TPM-based protocol to assert Cloud resources integrity**
  - protocol validation via reference validator AVISPA / Scyther
  - Application to IaaS (... and signature scheme above)

[CLOUD'11] B. Bertholon, S. Varrette, and P. Bouvry. CertiCloud: a Novel TPM-based Approach to Ensure Cloud IaaS Security. In 4th IEEE Intl. Conf. on Cloud Computing (CLOUD 2011), Washington DC, USA, July 2011

Research: VC platform security

- **Nature inspired ABFT for Volunteer computations**
  - [distributed] Evolutionary Algorithms
  - cheating ≃ negligible bias on evolution process
    - proved convergence of dEAs despite cheaters
    - under some special hypothesis

[NIDISC'11] S. Varrette, E. Tantar, and P. Bouvry. On the Resilience of [distributed] Evolutionary Algorithms against Cheaters in Global Computing Platforms. In14th Intl. Workshop on Nature Inspired Distributed Computing (NIDISC 2011), part of the 25th IEEE/ACM Intl. Parallel and Distributed Processing Symposium (IPDPS 2011), Anchorage (Alaska), USA, May 2011.

Research: EA-based optim

- **ACBEA** (automatic incremental HPC benchmark tuning)

[PPAM'09] D. Dunlop, S. Varrette, and P. Bouvry. Deskilling HPL - Using an Evolutionary Algorithm to Automate Cluster Benchmarking. In 8th Intl. Conf. on Parallel Processing and Applied Mathematics (PPAM 2009), LNCS 6068, p.102–114, Wroclaw, Poland, sept 2009

- **Genetic & src-to-src approach to Iterative compilation**
  - Phase-ordering problem solving by mean of EA over PIPS
    - *M*: finite set of transformations (loop unrolling etc.)
    - $\forall T, \forall P$ program, $\forall I$ input, $\exists ?\ s \in M^* / T_{exec}(s(P), I) < T$
    - EA-based solving to evolve a *transformation circuit*

[Renpar'09] S. Guelton and S. Varrette. Une approche génétique et source à source de l'optimisation de code. In 19 ème rencontres francophones du parallélisme (RenPar'19), Toulouse, France, Sept. 2009.

CSCI (SCCI) Master interest

- Strong theoretical basis (coding theory, EC etc.)
- Practical emphasis (system administration TPs)
- Provides “security” awareness
  - Unfortunately very rare in today’s society
    - understandable for ‘common’ people
    - less understandable for ≥ engineering level (project manager etc.)
  - still a lot of work to make people having secure behavior

Thank you for your attention!

Questions?

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