

Cihan Tunc

CONTACT INFO

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RESEARCH INTERESTS

Autonomic Computing • Cloud Computing • Internet of Things (IoT) • Power and Performance Management • Cyber Resilience • Secure Critical Infrastructures • Cybersecurity • Big Data Analytics

SKILLS

Programming Languages: C/C++, Perl, Shell Scripting, Python, Java, TCL

Cloud Platforms: Amazon AWS, OpenStack, VMWare vSphere, XenServer

Related Tools: Weka, Xen, KVM, MySQL, PostgreSQL

Related Libraries/APIs: Amazon AWS (Python), VMware SDK for Perl, MPI, OpenMP

Hardware Description Languages/Tools: Verilog, Xilinx ISE, Modelsim, Icarus Verilog

EDUCATION

The University of Arizona, Tucson, AZ

Aug 2011 – Jan 2015

Ph.D. in Computer Engineering – *GPA: 3.80 (Magna Cum Laude)*

Dissertation: “Autonomic Cloud Resource Management”

Research: Autonomic Power, Performance, and Security Management for Cloud Systems

Advisors: Prof. Salim Hariri & Prof. Ali Akoglu

Northeastern University, Boston, MA

Sep 2008 – May 2010

M.S. in Computer Engineering – *GPA: 3.375 (Cum Laude)*

MS Thesis: Variation and Defect Tolerance for Nano Crossbars

Advisor: Prof. Mehdi B. Tahoori

Bahcesehir University, Istanbul, Turkey

Sep 2003 – Jun 2008

B.S. in Electrical & Electronics Engineering – *GPA: 3.72 (Ranked 1st in the class)*

Graduation Project: Carry Save Tree Generation

Advisor: Prof. H. Fatih Ugurdag

WORK EXPERIENCE

The University of Arizona, Tucson, Arizona

Research Assistant Professor

May 2015 – Ongoing

- Research on power/energy and performance management of cloud computing systems
- Research on Cybersecurity Lab as a Service (CLaaS)
- Research on resilient and secure cloud computing systems and critical infrastructures
- Supervising graduate and undergraduate level students in the ACL lab
- Responsible for the platforms and infrastructures of the ACL lab at The University of Arizona
- Assisting Prof. Salim Hariri for “ECE677 - Distributed Computing” and “ECE 509 - Cybersecurity: Concept, Theory, and Practice”

The University of Arizona, Tucson, Arizona

Research Assistant

Aug 2011 – Jan 2015

- Autonomic Power & Performance Management for Cloud Systems
- Resilient Cloud Services
- AskCyPert – Cybersecurity as a Service (CLaaS) backend
- Acceleration of Hypothetical LDPC Decoders using FPGAs

- Responsible for the platforms and infrastructures of the ACL lab at The University of Arizona
- *(Please refer to the Projects section for more information)*

Teaching Assistant

Aug 2013 – Dec 2014

- Teaching MPI and OpenMP for “ECE677 – Distributed Computing System” (Fall 2013 and Fall 2014) and was responsible for the setup, configuration, and of the systems required during the class. Also, graded the homework and the projects
- Graded homework and projects for “ECE506 – Reconfigurable Computing” (Spring 2014)

Samsung Research America, Dallas, Texas

R&D Engineering Intern

May 2013 – Aug 2013

- Designed and optimized a MIMO detector architecture based on K-Best algorithm for Xilinx Virtex-6 (XCVLX550T) to be used in the next generation WiFi systems
- Implemented the required blocks using Verilog and Xilinx CoreGen to achieve very high throughput

Ozyegin University, Istanbul, Turkey

Research Assistant

Sep 2010 – Aug 2011

- Worked on “Row and Column Compressors”, *(Please refer to the Projects section)*

Instructor

Jan 2011 – Jul 2011

- Taught 23 high school students on making a line following robot (its designing, electronics components, and programming) in two weeks from scratch during RoboKamp at 2011

Teaching Assistant

Sep 2010 – Jul 2011

- Graded and assisted Java based “CS101 – Computer Programming”
- Assisted “EE564 – Computer Architecture & Performance”

Vestel Corporation, Manisa, Turkey

Lab Instructor

Sep 2010 – Dec 2010

- Instructed lab session of the “Embedded Systems Design” course, which included Computer Architecture, PIC programming, and Embedded System Design using FriendlyARM boards

Northeastern University, Boston, MA

Research Assistant

Sep 2008 – May 2010

- Worked on “Variation and Defect Tolerance for Nano Crossbars”, *(Please refer to the Projects section)*

Teaching Assistant

Sep 2008 – May 2010

- Instructed “EECE2413 – Electronics Lab” (Fall 2009 and Spring 2010)
- Graded “EECE3324 – Computer Architecture and Organization” (Spring 2009)
- Graded “EECE2312 – Digital Logic Design” (Fall 2008)

Bahcesehir University, Istanbul, Turkey

Undergraduate Lab Assistant

Feb 2007 – Jun 2007

- Helped students in the FPGA-based “Digital System Design Lab” (Fall 2007)

RELATED RESEARCH PROJECTS

Autonomic Power & Performance Management for Cloud Systems

Aug 2012 – Ongoing

- The project aims on reducing power consumption of Cloud systems without sacrificing high performance by re-allocating VM resources using AppFlow case-based reasoning and data mining.
- A private Cloud was built using Xen hypervisor on IBM HS-22 blade server (and allocated 10 blades).
- The system is monitored based on the utilization of the resources from different perspectives: VM resource utilization, the processes’ resource usage, resource utilization of VMs from hypervisor, and the physical host system utilization.
- A performance-per-Watt based autonomic resource management tool is developed, that focuses on power consumption reduction without sacrificing high performance using AppFlow case-based reasoning and data mining techniques.
- The system reduces power consumption up to 80% compared to static resources and up to 30% compared to other dynamic methods.
- *(More information can be found in Publication 6, 7, 9, 10)*

Value of Service Based Task Scheduling for Cloud Computing Systems

Aug 2012 – Ongoing

- We focus on task scheduling approaches to reduce total energy consumption while maintaining task performance.
- A power model has been created to predict the total energy consumption of the tasks running on the VMs.
- Value of Service concept that depends on the performance and energy values have been developed.
- This approach increases the value gained by tasks' performance upto 50% and energy 40% compared to the simple heuristics.
- (*More information can be found in Publication 10, 16, 20*)

Resilient Cloud Services

Jan 2014 – Ongoing

- Developed a framework that applies Moving Target Defense and software obfuscation for resilient cloud services.
- The framework uses multiple hierarchy levels (e.g. workers, masters, supervisors) to control the services running.
- Built the system using OpenStack and different MapReduce implementations (i.e. Hadoop, MRS-MapReduce, etc.).
- Implemented multiple attack scenarios mimicking DoS attacks.
- (*More information can be found in Publication 8, 17, 21*)

AskCyPert – Cybersecurity as a Service (CLaaS) Backend

Jan 2014 – Ongoing

- The project aims to provide a virtual autonomic cybersecurity lab for the users with multiple experiment options.
- The CLaaS backend is built where VMs, vSwitches, vNetworks, etc. are created and configured for each experiment/testbed automatically.
- Perl SDK for VMware and VIX are used for VMware vSphere 5.5 on multiple high-end Intel servers.
- (*More information can be found on <http://askcypert.org/> and Publications 11, 12, and 14*)

Data Storage Resiliency in Cloud Systems

Jan 2014 – Ongoing

- Developing resilient data storage service framework for cloud computing using OpenStack.
- The framework uses OpenStack's object storage service Swift in the backend and will be applying security in authentication and will be applying anomaly detection in storage.

Acceleration of Hypothetical LDPC Decoders using FPGAs

Jan 2012 – Sep 2013

- Developed a tool to evaluate hypothetical LDPC decoders on any FPGA without user involvement.
- The tool generates Verilog for any code-rate & code-length LDPC decoders for multiple pre-defined architectures.
- The tool synthesizes the generated Verilog codes using Xilinx ISE shell, uploads the bitstream on to the FPGA for simulations, and extracts the Floor Error Rate and the codes that result with errors after the simulations.
- Fully serial architecture is included in the pre-defined architecture list.

Row and Column Compressors for FPGAs and ASICs

Sep 2010 – Aug 2011

- Built a framework for benchmarking various summation and multiplication methods.
- The framework generates Verilog RTLs and then tests the designs with testbenches. If the designs pass the testbench, they are *synthesized* using *Xilinx ISE* and/or *Synopsys DC*.
- The framework uses binary decision tree to achieve *higher performance*.
- (*More information can be found in Publication 4*)

Variation and Defect Tolerance for Nano Crossbars

Sep 2008 – May 2010

- Developed variation and defect tolerant logic mapping algorithms for nano crossbars (e.g., Simulated Annealing based framework).
- Enabled mapping a design on nano crossbars even under high defect and variation conditions (as high as 10%).
- (*More information can be found in Publications 1, 2, and 3*)

PUBLICATIONS

- 21) **C. Tunc**, S. Hariri, and A. Battou, "A Design Methodology for Developing Resilient Cloud Services (RCS)," Handbook of System Safety and Security: Cyber Risk and Management, Cyber Security, Threat Analysis, Functional Safety, Software Systems, and Cyber Physical Systems. Edited by Edward Griffor, Elsevier Inc., to be published in 2016.

- 20) **C. Tunc**, N. Kumbhare, A. Akoglu, S. Hariri, D. Machovec, H.J. Siegel, “*Value of Service Based Task Scheduling for Cloud Computing Systems*,” IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2016), Augsburg, Germany, 2016
- 19) J. Yu, **C. Tunc**, S. Hariri, “*Automated Framework for Scalable Collection and Intelligent Analytics of Hacker IRC Information*,” IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2016), Augsburg, Germany, 2016
- 18) S. Gu, L. Yao, **C. Tunc**, A. Akoglu, S. Hariri, E. Ritchie, “*An Autonomic Workflow Performance Manager for Weather Research and Forecast Workflows*,” IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2016), Augsburg, Germany, 2016 (short paper)
- 17) J. Pacheco, **C. Tunc**, S. Hariri, “*Design and Evaluation of Resilient Infrastructures Systems for Smart Cities*,” IEEE International Smart Cities Conference (ISC2), 2016, Trento, Italy
- 16) D. Machovec, **C. Tunc**, N. Kumbhare, B. Khemka, A. Akoglu, S. Hariri, H.J. Siegel, “*Value-Based Resource Management in High-Performance Computing Systems*,” 7th ACM Workshop on Scientific Cloud Computing (ScienceCloud '16), New York, NY, USA,
- 15) S. Hariri, **C. Tunc**, P. Satam, F. Al-Moualem, E. Blasch, “*DDDAS-Based Resilient Cyber Battle Management Services (D-RCBMS)*”, IEEE 22nd International Conference on High Performance Computing Workshops (HiPCW), 2015
- 14) **C. Tunc** and S. Hariri, “*CLaaS: Cybersecurity Lab as a Service*”, Journal of Internet Services and Information Security (JISIS), Volume 5, Issue 4, November 2015, p 41-59
- 13) J.H. Pacheco Ramirez, B. AlBaalbaki, **C. Tunc**, S. Hariri, Y. Al-Nashif, “*Anomaly Behavior Analysis System for ZigBee in Smart Buildings*”, 12th ACS/IEEE International Conference on Computer Systems and Applications AICCSA 2015 Marrakech, Morocco
- 12) **C. Tunc**, S. Hariri, F. Montero, F. Fargo, P. Satam “*CLaaS: Cybersecurity Lab as a Service -- Design, Analysis, and Evaluation*”, IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2015), Boston, MA, USA, 2015 (short paper)
- 11) **C. Tunc**, S. Hariri, Y. Al-Nashif, F. Montero, F. Fargo, P. Satam “*Teaching and Training Cybersecurity as a Cloud Service*”, in IEEE International Workshop on Autonomic Cloud Cybersecurity (ACC 2015), Boston, MA, USA, 2015
- 10) B. Khemka, D. Machovec, C. Blandin, H.J. Siegel, S. Hariri, A. Louri, **C. Tunc**, F. Fargo, and A.A. Maciejewski. “*Resource Management in Heterogeneous Parallel Computing Environments with Soft and Hard Deadlines*,” The XI Metaheuristics International Conference (MIC2015), Agadir, Morocco. 2015.
- 9) **C. Tunc**, “*Autonomic Cloud Resource Management*”, **PhD Dissertation**, Jan 2015
- 8) **C. Tunc**, F. Fargo, Y. Al-Nashif, S. Hariri, J. Hughes “*Autonomic Resilient Cloud Management (ARCM): Design and Evaluation*”, in IEEE International Conference on Cloud and Autonomic Computing (CAC 2014), London, UK., 2014
- 7) F. Fargo, **C. Tunc**, Y. Al-Nashif, A. Akoglu, S. Hariri “*Autonomic Management of Cloud Resources and Services Framework*”, in IEEE International Conference on Cloud and Autonomic Computing (CAC 2014), London, UK., 2014
- 6) F. Fargo, **C. Tunc**, Y. Al-Nashif, S. Hariri, “*Autonomic Performance-per-Watt Management (APM) of Cloud Resources and Services*”, in ACM Cloud and Autonomic Computing Conference, Miami, Florida, USA, 2013
- 5) B. Yuce, S. Korkmaz, V.B. Esen, F. Temizkan, **C. Tunc**, G. Guner, I.F. Baskaya, I. Agi, G. Dundar, H.F. Ugurdag, “*Synthesis of Clock Trees for Sampled-Data Analog IC Blocks*”, in East-West Design & Test Symposium, Kharkiv, Ukraine, 2012
- 4) F. Ugurdag, O. Keskin, **C. Tunc**, F. Temizkan, G. Fici, S. Dedeoglu, “*RoCoCo: Row and Column Compression for High-Performance Multiplication on FPGAs*”, in East-West Design & Test Symposium, Sevastopol, Ukraine, 2011 (outstanding paper award)
- 3) **C. Tunc**, “*Variation and Defect Tolerance for Nano Crossbars*”, MS Thesis, May 2010

- 2) **C. Tunc**, M.B. Tahoori, “*On-the-fly Variation Tolerant Mapping in Crossbar Nano-Architectures*”, in IEEE VLSI Test Symposium (VTS), Santa Cruz, California, USA, 2010
- 1) **C. Tunc**, M.B. Tahoori, “*Variation Tolerant Logic Mapping for Crossbar Array Nano Architectures*”, in IEEE Asia and South Pacific Design Automation Conference (ASP-DAC), Taipei, Taiwan, 2010 (**best paper nomination**)

POSTERS, PRESENTATIONS, TALKS

- 9) **C. Tunc**, S. Hariri, F. Montero, F. Fargo, P. Satam “CLaaS: Cybersecurity Lab as a Service -- Design, Analysis, and Evaluation” in IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2015), Boston, MA, USA, 2015 (short paper poster)
- 8) F. Fargo, **C. Tunc**, Y. Al-Nashif, A. Akoglu, S. Hariri “*Autonomic Management of Cloud Resources and Services Framework*”, IEEE International Conference on Cloud and Autonomic Computing (CAC 2014), London, UK., 2014 (**best poster award**)
- 7) **C. Tunc**, F. Fargo, Y. Al-Nashif, S. Hariri, J. Hughes “*Autonomic Resilient Cloud Management (ARCM): Design and Evaluation*”, IEEE International Conference on Cloud and Autonomic Computing (CAC 2014), London, UK., 2014. (poster)
- 6) **Cihan Tunc**, Jose Salcedo, Fabian De La Pena, Shrivasta, Youssif Al-Nashif, Salim Hariri “*AskCyPert – Cybersecurity Lab as a Service*”, IEEE International Conference on Cloud and Autonomic Computing (CAC 2014), London, UK., 2014. (poster)
- 5) **Cihan Tunc**, “*Parallel Distributed Computing*”, Simposio Internacional de Ingeniería, Sistemas y Tecnología, Hermosillo, Mexico 2014 (presentation)
- 4) **Cihan Tunc**, Farah Fargo, Youssif Al-Nashif, Salim Hariri, “*Cloud Computing Resiliency Through Dynamic Redundancy*”, Simposio Internacional de Ingeniería, Sistemas y Tecnología, Hermosillo, Mexico 2014 (presentation)
- 3) Farah Fargo, **Cihan Tunc**, Youssif Al-Nashif, Salim Hariri, Ali Akoglu, “*Autonomic Cloud Management System*”, Second Franco-American Workshop, Arizona, Tucson, USA, 2014 (poster)
- 2) **Cihan Tunc**, Farah Fargo, Youssif Al-Nashif, Salim Hariri, Ali Akoglu, “*Autonomic Cloud Management (ACM)*”, Intel, Phoenix, US, 2013 (poster)
- 1) Zhitao Li, Farah Fargo, **Cihan Tunc**, Youssif Al-Nashif, Salim Hariri, Ali Akoglu, “*Cloud Autonomic Manager (CAM)*”, NSF CAC Semiannual Meeting, Tucson, AZ, 2011 (poster and presentation)

AWARDS

- Best poster award in CAC’14 (Posters, Presentations, Talks section, #8)
- Graduate Research Assistantship in the ECE Dept of the University of Arizona (Fall 2011 – Spring 2015)
- Graduate Research/Teaching Assistantship in the ECE Dept of Northeastern University (Fall 2008 – Spring 2010)
- Outstanding paper award (Publications #4)

PROFESSIONAL ACTIVITIES

- Associate Editor, Cluster Computing Journal, Springer
- Registration and Publication Chair, 13th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA 2016), Agadir, Morocco
- Program Co-Chair, IEEE International Workshop on Big Data Analytics for Cybersecurity computing (BDAC 2016), Tucson, AZ, USA
- Publication Chair, IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2016), Augsburg, Germany
- Registration Chair, 12th ACS/IEEE International Conference on Computer Systems and Applications AICCSA 2015, Marrakech, Morocco

- Registration and Publication Chair, IEEE International Conference on Cloud and Autonomic Computing (ICCAC 2015), Boston, MA, USA
- Registration and Publication Chair, IEEE International Workshop on Autonomic Cloud Cybersecurity (ACC 2015), Boston, MA, USA
- Reviewer for Cluster Computing Journal, Springer
- Reviewer for Transactions on Cloud Computing, IEEE
- Reviewer for Transactions on Management Information Systems, ACM

MEMBERSHIP

- IEEE member (since 2006)
- Turkish Student Association at the University of Arizona (President, Spring 2012 – Fall 2014)

MAJOR COURSEWORK

• Cybersecurity - Concept, Theory, Practice • Distributed Computing • Reconfigurable Computing • Algorithms, Graphs, and Networks • Simulation, Modeling, and Analysis • Engineering of Computer Based Systems • Computer Aided Logic Design • Computer Vision • Computer Architecture & Performance • VLSI Design • VLSI Testing & Design for Testability • Combinatorial Optimization • Fundamentals of Computer Eng. • Image & Video Processing • Analysis of Algorithms • Microprocessors • Digital System Design

REFERENCES

Prof. Salim Hariri, The University of Arizona, Tucson, AZ

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Prof. Ali Akoglu, The University of Arizona, Tucson, AZ

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Prof. Youssif Al-Nashif, Florida Polytechnic University, Lakeland, FL

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Prof. H. Fatih Ugurdag, Ozyegin University, Istanbul, Turkey

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