

# Thomas S. Repantis

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RESEARCH INTERESTS     **Distributed Systems:** Distributed Stream Processing Systems, Middleware, Peer-to-Peer Systems, Mobile and Ubiquitous Computing, Distributed Shared Memory Systems, Cluster and Grid Computing.

EDUCATION     **University of California, Riverside**  
Ph.D. Candidate in Computer Science, degree expected summer 2008  
Thesis: *Synergy: Quality of Service Support for Distributed Stream Processing Systems*  
  
M.Sc. in Computer Science, August 2005  
Thesis: *Adaptive Data Dissemination and Content-Driven Routing in Peer-to-Peer Systems*  
Advisor: Prof. Vana Kalogeraki  
GPA: 3.900/4.000  
  
◇ **University of Patras, Greece**  
Diploma (5-year program) in Electrical & Computer Engineering, March 2003  
Thesis: *Implementation of Page Forwarding on Clusters*  
Advisors: Prof. Theodore S. Papatheodorou, Prof. Dimitrios N. Serpanos  
GPA: 7.70/10.00

PROFESSIONAL EXPERIENCE     ◇ **University of California, Riverside**, Department of Computer Science & Engineering, Distributed Real-Time Systems Laboratory, January 2004–Present, Graduate Student Researcher, Advisor: Prof. Vana Kalogeraki  
Leading the development in Java of the Synergy distributed stream processing middleware; supervising other student research projects now using the platform. <http://synergy.cs.ucr.edu>

- **Sharing-aware component composition.** Distributed stream processing systems need to satisfy application QoS requirements despite the shared, dynamic, and large-scale environment. I have designed and implemented in Synergy techniques for composing distributed stream processing applications with QoS demands. Synergy enhances QoS provision and reduces resource load by efficiently reusing both data streams and processing components. To achieve this goal Synergy provides a set of fully distributed algorithms to discover and evaluate the reusability of available data streams and processing components when instantiating new stream applications. For QoS provision, Synergy performs QoS impact projection to examine whether the shared processing can cause QoS violations on currently running applications. Projection is based on queuing theoretical models for both regular and bursty traffic. For initial component deployment Synergy employs a decentralized replica placement protocol that aims to maximize availability, while respecting resource constraints, and making performance-aware placement decisions.
- **Load prediction and hot-spot alleviation.** Managing the load of the nodes of a large-scale, dynamic distributed stream processing system in real-time and without centralized supervision is challenging. I have designed and implemented in Synergy a self-managing resource monitoring architecture for identifying and relieving overloaded nodes. Monitoring responsibilities are shared among all nodes using a completely

decentralized DHT-based architecture. Nodes proactively predict application QoS violations at run-time using a statistical forecasting framework based on auto- and cross-correlation, as well as linear regression. To alleviate hot-spots, nodes autonomously migrate the execution of stream processing components using a non-disruptive migration protocol. I have evaluated Synergy's performance over PlanetLab by implementing a network traffic monitoring application operating on real streaming data.

- **Managing large-scale, distributed, real-time applications.** Satisfying end-to-end QoS requirements in large-scale distributed real-time applications is challenging, due to the unpredictability and heterogeneity of the environment. Focusing on media streaming and transcoding as an example, I have co-designed in C++ a decentralized architecture that enables nodes to collaborate to offer composite applications. A resource allocation algorithm distributes the processing and communication loads fairly, while satisfying application end-to-end QoS demands. Nodes adapt to variable resource conditions by optimizing their resource usage locally, selecting from discrete QoS output levels. Multiple nodes participating in a composite application coordinate their QoS through feedback from the service receiver.
- **Data dissemination in peer-to-peer systems.** Efficiently locating data or services in a fully decentralized, self-organizing, unstructured overlay network is challenging, due to the large scale and the lack of global view. I have designed in Java a content-driven routing mechanism that guides queries to peers most probable to provide results. Intelligently routing queries is based on Bloom filter synopses of peers' content. Adaptive dissemination algorithms propagate synopses according to peers' interactions. A decentralized trust management architecture enables peers to evaluate reputation information and avoid lying and colluding.
- ◇ **IBM Research**, T.J. Watson Research Center, Hawthorne, NY, June 2007–September 2007, Research Intern, Mentors: Dr. Arun Iyengar, Dr. Isabelle Rouvellou  
As a member of the advanced enterprise middleware group, designed, implemented in Java, evaluated, and documented a replication middleware for distributed, multi-tier, server architectures. Proposed and incorporated in the middleware an efficient, distributed strong consistency protocol. Quantified the server replication and data partitioning performance benefits, as well as the consistency overhead, using the TPC-W transactional web commerce benchmark.
- ◇ **Intel Research**, Pittsburgh, PA, June 2006–September 2006, Research Intern, Mentors: Dr. Michael Kaminsky, Dr. Haifeng Yu  
As a member of the research team of the reliable email project, designed, implemented in C++, and documented an event-driven software prototype of a collaborative spam filter that employs a distributed protocol to defend against sybil attacks.
- ◇ **Hewlett-Packard**, Technology Solutions Group, Enterprise Storage & Servers, Colorado Springs, CO, June 2005–September 2005, Software Intern, Mentors: Dr. Debby Levinson, Chris Stroberger  
As a member of the replication team of an upcoming product of HP's grid storage portfolio, designed, implemented in C++, and documented a logging mechanism used for asynchronous replication in a distributed disk array.
- ◇ **University of California, Riverside**, Department of Computer Science & Engineering, September 2003–December 2003, Teaching Assistant, Instructor: Wagner Truppel  
Instructed a lab on C++ programming, and evaluated assignments and exams. Anonymous student reviews included: "Very caring TA. Will teach and willing to spend extra time.", "The best TA I ever had."
- ◇ **University of Patras, Greece**, Department of Computer Engineering & Informatics, High Performance Information Systems Laboratory, January 2001–November 2002, Undergraduate Student Researcher, Advisors: Dr. Christos D. Antonopoulos, Prof. Theodore S. Papatheodorou

Designed and implemented in C a protocol for dynamic memory page migration across the nodes of a Software Distributed Shared Memory System, as part of an inter-departmental diploma thesis. Dynamic page migration improves performance by increasing locality and adaptability, while remaining transparent to the application programmer.

- ◇ **FGAN e.V.**, Research Institute for Communication, Information Processing and Ergonomics, Computer Networks Department, Bonn, Germany, July 2000–August 2000, Intern, Mentors: Dr. Christian Riechmann, Peter Sevenich  
Analyzed the H.323 protocol family, used for multimedia applications (VoIP) in packet switched networks, and summarized the results in a technical report, including detailed protocol description and performance evaluation of applications under IPv6 in Solaris.
- ◇ **University of Patras, Greece**, Department of Electrical & Computer Engineering, October 1998–March 1999, Web Developer, Supervisors: Prof. Nikolaos Avouris, Prof. Athanasios Safacas. As a member of the team that created the department’s web site, developed and tested web pages in HTML.
- ◇ **Hot-Spot Prediction and Alleviation in Distributed Stream Processing Applications**, Thomas Repantis, Vana Kalogeraki, Proceedings of the 38th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2008). Acceptance rate (PDS track):  $19/87=22\%$
- ◇ **Replica Placement for High Availability in Distributed Stream Processing Systems**, Thomas Repantis, Vana Kalogeraki, Proceedings of the 2nd International Conference on Distributed Event-Based Systems (DEBS 2008).
- ◇ **Alleviating Hot-Spots in Peer-to-Peer Stream Processing Environments**, Thomas Repantis, Vana Kalogeraki, Proceedings of the 5th International Workshop on Databases, Information Systems and Peer-to-Peer Computing (DBISP2P 2007) (in conjunction with VLDB 2007). Acceptance rate: 21%
- ◇ **Synergy: Sharing-Aware Component Composition for Distributed Stream Processing Systems**, Thomas Repantis, Xiaohui Gu, Vana Kalogeraki, Proceedings of the 7th ACM/IFIP/USENIX International Middleware Conference (MIDDLEWARE 2006). Acceptance rate:  $21/122=17\%$
- ◇ **Decentralized Trust Management for Ad-Hoc Peer-to-Peer Networks**, Thomas Repantis, Vana Kalogeraki, Proceedings of the 4th International Workshop on Middleware for Pervasive and Ad-Hoc Computing (MPAC 2006) (in conjunction with MIDDLEWARE 2006). Acceptance rate:  $6/24=25\%$
- ◇ **Load Balancing Techniques for Distributed Stream Processing Applications in Overlay Environments**, Yannis Drougas, Thomas Repantis, Vana Kalogeraki, Proceedings of the 9th IEEE International Symposium on Object- and Component-Oriented Real-Time Distributed Computing (ISORC 2006). Acceptance rate: 35%
- ◇ **A Comprehensive Comparison of Routing Protocols for Large-Scale Wireless MANETs**, Ioannis Broustis, Gentian Jakllari, Thomas Repantis, Mart Molle, Proceedings of the 3rd International Workshop on Wireless Ad Hoc and Sensor Networks (IWVAN 2006) (in conjunction with SECON 2006).
- ◇ **A Case for Dynamic Page Migration in Multiple-Writer Software DSM Systems**, Thomas Repantis, Christos D. Antonopoulos, Vana Kalogeraki, Theodore S. Papatheodorou, Proceedings of the 7th IEEE International Conference on Cluster Computing (CLUSTER 2005). Acceptance rate:  $45/138=33\%$
- ◇ **Data Dissemination in Mobile Peer-to-Peer Networks**, Thomas Repantis, Vana Kalogeraki, Proceedings of the 6th International Conference on Mobile Data Management (MDM 2005). Acceptance rate: 25%
- ◇ **Coordinated Media Streaming and Transcoding in Peer-to-Peer Systems**, Fang Chen, Thomas Repantis, Vana Kalogeraki, Proceedings of the 19th IEEE International Parallel and Distributed Processing Symposium (IPDPS 2005). Acceptance rate:  $116/338=34\%$

REFEREED  
PUBLICATIONS

- MANUSCRIPTS  
UNDER  
REVIEW

  - ◇ **Adaptive Resource Management in Peer-to-Peer Middleware**, Thomas Repantis, Yannis Drougas, Vana Kalogeraki, Proceedings of the 13th International Workshop on Parallel and Distributed Real-Time Systems (WPDRTS 2005) (in conjunction with IPDPS 2005).
  - ◇ **Towards Self-Managing QoS-Enabled Peer-to-Peer Systems**, Vana Kalogeraki, Fang Chen, Thomas Repantis, Demetris Zeinalipour-Yazti, Self-Star Properties in Complex Information Systems, Hot Topics in Computer Science, Springer LNCS, vol. 3460, 2005.
  - ◇ **Dynamic Page Migration in Software DSM Systems**, Thomas Repantis, Christos D. Antonopoulos, Vana Kalogeraki, Theodore S. Papatheodorou, Proceedings of the 6th IEEE International Conference on Cluster Computing (CLUSTER 2004) (poster session).
  - ◇ **Sharing-Aware Dynamic Component Composition for Distributed Stream Processing Systems**, Thomas Repantis, Xiaohui Gu, Vana Kalogeraki.
  - ◇ **Consistent Replication in Distributed Multi-Tier Architectures**, Thomas Repantis, Arun Iyengar, Vana Kalogeraki, Isabelle Rouvellou.
  
- TECHNICAL  
REPORTS

  - ◇ **Logging Service Architecture Strategy and Design**, Chris Stroberger, Thomas Repantis, Internal Report, Hewlett-Packard, 2005.
  - ◇ **A Performance Comparison of Routing Protocols for Large-Scale Wireless Mobile Ad Hoc Networks**, Ioannis Broustis, Gentian Jakllari, Thomas Repantis, Mart Molle, Technical Report UCR-CS-2003-12001, University of California, Riverside, 2003.
  - ◇ **Analysis of the H.323 Protocol Suite**, Thomas Repantis, Peter Sevenich, Technical Report FKIE-KOM 2000/4, FGAN e.V., 2000.
  
- SELECTED  
POSTERS

  - ◇ **Synergy: Quality of Service Support for Distributed Stream Processing Systems**, Thomas Repantis, Vana Kalogeraki, Xiaohui Gu, Graduate Research Awards and Colloquium, University of California, Riverside, 2008. *Graduate Research Award.*
  - ◇ **The Synergy Distributed Stream Processing Middleware**, Thomas Repantis, Xiaohui Gu, Vana Kalogeraki, Board of Advisors Meeting, University of California, Riverside, 2007.
  - ◇ **Replication Trade-Offs in Composite Distributed Applications**, Thomas Repantis, Arun Iyengar, Isabelle Rouvellou, IBM Summer Student Poster Session 2007.
  - ◇ **Synergy: A Distributed Stream Processing Middleware**, Thomas Repantis, Xiaohui Gu, Vana Kalogeraki, Graduate Research Awards and Colloquium, University of California, Riverside, 2007. *Honorable Mention.*
  - ◇ **Defending Against Sybil Attacks in the Reliable Email Project**, Thomas Repantis, Haifeng Yu, Michael Kaminsky, Phillip B. Gibbons, Abraham Flaxman, Poster and Demo Session, Intel Research Symposium 2006.
  - ◇ **Cooperative Media Processing and Streaming**, Thomas Repantis, Fang Chen, Vana Kalogeraki, 7th Annual Industry Day Poster Session, University of California, Riverside, 2005. *Second Best Graduate Poster Award.*
  
- PATENT  
APPLICATION

  - ◇ **Method and System for Coordinating Updates to Replicated Data**, Arun Iyengar, Thomas Repantis, IBM YOR9-2007-0716, 2008.
  
- TECHNICAL  
SKILLS

  - ◇ **Operating Systems:** UNIX (Linux, FreeBSD, Solaris, HP-UX), MS Windows, Mac OS X, DOS.
  - ◇ **Languages:** C++, C, Java, Assembly (i8085, i80x86, ADSP-21xx), Shell, Python, Perl, SQL, LISP, PROLOG, FORTRAN, UML, HTML, XML, JavaScript, MS Visual Basic, BASIC.
  - ◇ **APIs:** STL, RPC, libasync, pthreads, TCP/IP (sockets), FreePastry, Servlets, Swing.

- ◇ **Applications:** PlanetLab, gdb, make, ant, CVS, ClearCase, Subversion, Eclipse, emacs, doxygen, CppUnit, valgrind, log4j, samba, tomcat, apache, mod\_ssl, OpenSSL, MySQL, matlab, spice, LabVIEW, ns-2, NeuroGrid P2P Simulator, ComNet III, QualNet, ERwin, L<sup>A</sup>T<sub>E</sub>X, gnuplot, MS Office.

SCHOLARSHIPS  
AND AWARDS

- ◇ **University of California, Riverside:** Award at the Graduate Research Awards and Colloquium, 4 awards granted throughout the university, the only recipient from Computer Science & Engineering Department, June 2008.
- ◇ **Gerondelis Foundation:** Graduate study scholarship, May 2008.
- ◇ **IFIP:** Student travel award for attending DSN 2008, June 2008.
- ◇ **University of California, Riverside:** Honorable mention at the Graduate Research Awards and Colloquium, 4 awards and 4 honorable mentions granted throughout the university, the only recipient from Computer Science & Engineering Department, April 2007.
- ◇ **ACM:** Student travel award for attending MIDDLEWARE 2006, November 2006.
- ◇ **City of Riverside:** Honorary residency for pursuing an international academic goal, May 2006.
- ◇ **University of California, Riverside:** Second best graduate poster award at the 7th Annual Industry Day Poster Session, 3 out of 36 nominees selected, the only awardee from Computer Science & Engineering Department, October 2005.
- ◇ **IEEE Computer Society, Technical Committee on Scalable Computing:** Student travel award for attending CLUSTER 2005, September 2005.
- ◇ **IEEE Computer Society, Technical Committee on Parallel Processing:** Student travel award for attending IPDPS 2005, 35 out of 75 nominees selected, April 2005.
- ◇ **University of California, Riverside:** Dean's graduate fellowship award, September 2003–May 2005.
- ◇ **Erdős Number:** 4 (Vana Kalogeraki, Dimitrios Gunopulos, Bela Bollobas, Paul Erdős).
- ◇ **University of Patras:** Honor for the highest GPA in the Department of Electrical & Computer Engineering on the commencement of March 2003.
- ◇ **Zosima Foundation:** Scholarship for excellence during university studies, received after open examination from the Greek Ministry of Education, September 1997–May 2002.
- ◇ **International Association for the Exchange of Students for Technical Experience, German Academic Exchange Service:** Scholarship for practical traineeship abroad, July 2000–August 2000.
- ◇ **City of Patras:** Honor for ranking first in the national examination for admission to the Department of Electrical & Computer Engineering of the University of Patras, approximately 150,000 total participants, September 1997.
- ◇ **Greek Ministry of Education:** Annual honors and awards for the highest GPA in class, 1990–1996.

PROFESSIONAL  
ACTIVITIES

- ◇ Student member of IEEE, IEEE Computer Society, ACM, USENIX.
- ◇ Reviewer for Elsevier Computer Communications, IGI Handbook on Mobile P2P Computing, ICC'08, CCNS'08, PV'07, ISORC'06, LCN'05, ICPS'05, RTAS'04.
- ◇ External Reviewer for WWW'08, RTSS'08, WOWMOM'08, NETWORKING'08, ICDCS'07, ICPP'07, DOA'07, NETWORKING'07, INFOSCALE'07, DSN'06, SIGCOMM'05, RTSS'05, PODS'05, MDM'05, GLOBECOM'04, DBISP2P'04.
- ◇ Student Volunteer for CLUSTER'04.
- ◇ Volunteer for HP Employee Demo Day'05.

LANGUAGES

- ◇ **English:** Cambridge Certificate of Proficiency in English: Grade A, June 1999

*Thomas S. Repantis*

- ◇ **German:** Großes Deutsches Sprachdiplom: Gut, November 2002
- ◇ **Greek:** Native

REFERENCES Available upon request.