

# Yungang Bao

Professor

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## EDUCATION

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- **Ph.D. 2008**, Institute of Computing Technology, Chinese Academy of Sciences, P.R. China  
Dissertation: Performance Analysis and Optimization for Memory System  
Advisors: Prof. Jianping Fan and Prof. Mingyu Chen.
- **B.S. 2003**, Nanjing University, Najing, P.R.China.  
Advisor: Prof. Chunfeng Yuan

## RESEARCH INTERESTS

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Computer Architecture, Operating System, System Performance Modeling and Evaluation, Cloud Computing

## PROFESSIONAL EXPERIENCE

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- 2017.1 ~ Executive Director of Center for Advanced Computer Systems, ICT, CAS
- 2015.9 ~ Professor, Institute of Computing Technology, Chinese Academy of Sciences (ICT, CAS)
- 2015.4 ~ Associate Director of Center for Advanced Computer Systems, ICT, CAS
- 2011.9 ~ 2015.09 Associate Professor, Institute of Computing Technology, Chinese Academy of Sciences
- 2010.10 ~ 2012.9 Visiting Postdoctoral Fellow, Department of Computer Science, Princeton University
- 2008.9 ~ 2011.9 Assistant Professor, Institute of Computing Technology, Chinese Academy of Sciences

## PROJECTS

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- **LvNA: Labeled von Neumann Architecture** 2016.7 ~  
This project is an extension of the PARD project. We are going to build real chip and investigate the whole stack on the LvNA. Currently, we have implemented a RISC-V based FPGA prototype (a.k.a. Labeled RISC-V) that has been already open-sourced.
- **PARD: Programmable Architecture of Resourcing on-Demand** 2012.10 ~ 2016.6  
This project investigates architectural support for resource-efficient datacenters based on the insight: The Computer as a Network (CaaN). The goal is to reconstruct a computer to be an SDN-like (software-defined networking) network that enables new functionalities such as hardware virtualization w/o software hypervisor, architectural supported quality-of-service (QoS) and differentiated services. PARD is able to improve datacenter's resource utilization while ensuring applications' QoS.

- **UpTCP: User-Level Pipelined TCP/IP Stack** 2010.3~ 2016.8  
Aim to design a user-level pipelined TCP/IP stack which is a part of PARSEC benchmark and can run on multicore platform more efficiently.
- **Memory System Design for High-Throughput Computing** 2008.10~2010.9  
Mainly focuses on studying the impact of the extreme I/O memory requests, e.g., GPU and Infiniband, on the memory system.
- **HMTT: A Hybrid Hardware/Software Memory Trace Tool** 2005.9 ~ 2010.9  
Design and implement a hybrid hardware/software memory trace tool which is able to collect off-chip memory traces of many real-world applications, with some important information, such as timestamp, pid, cpu-request/io-request, r/w, virt\_addr and phys\_addr.
- **SandFoxy: A System-Level Simulator for Reconfigurable Computer Architecture** 2003.9 ~ 2005.7  
Build a system-level simulator which can simulate a reconfigurable computer architecture (DSAG). The simulator can boot OS and run a number of parallel applications.

## PUBLICATIONS

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- Zihao Yu, Bowen Huang, Jiuyue Ma, Ninghui Sun, Yungang Bao, **Labeled RISC-V: A New Perspective on Software-Defined Architecture**. First Workshop on Computer Architecture Research with RISC-V (CARRV 2017) Co-located with MICRO, 2017.
- Yuqing Zhu, Jianxun Liu, Mengying Guo, Yungang Bao, Wenlong Ma, Zhuoyue Liu, Kunpeng Song, Yingchun Yang, **BestConfig: tapping the performance potential of systems via automatic configuration tuning**. Symposium on Cloud Computing (SoCC), 2017.
- Tianwei Zhang, Yuan Xu, Yungang Bao, Ruby B. Lee, **CloudShelter: Protecting Virtual Machines' Memory Resource Availability in Clouds**, IEEE International Conference on Computer Design (ICCD), 2017.
- Yuqing Zhu, Jianxun Liu, Mengying Guo, Wenlong Ma, Yungang Bao, **ACTS in Need: Automatic Configuration Tuning with Scalability Guarantees**. Proceedings of the 8th Asia-Pacific Workshop on Systems (APSys), 2017.
- Shiqi Lian, Yinhe Han, Ying Wang, Yungang Bao, Hang Xiao, Xiaowei Li, Ninghui Sun, **Dadu: Accelerating Inverse Kinematics for High-DOF Robots**, Proceedings of the 54th Annual Design Automation Conference (DAC) 2017.
- Yungang Bao, Sa Wang, **Labeled von Neumann Architecture for Software-Defined Cloud**. Journal of Computer Science and Technology ((JCST)), 32(2): 219-223, 2017.
- Jiuyue Ma, Xiufeng Sui, Ninghui Sun, Yupeng Li, Zhihao Yu, Bowen Huang, Tiani Xu, Zhicheng Yao, Yun Chen, Haibin Wang, Lixing Zhang, Yungang Bao, **Supporting Differentiated Services in Computers via Programmable Architecture for Resourcing-on-Demand (PARD)**, in the 20th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2015.
- Zehan Cui, Sally A. McKee, Zhongbin Zha, Yungang Bao, Mingyu Chen, **DTail: A Flexible Approach to DRAM Refresh Management**, to appear in *ACM International Conference on Supercomputing (ICS)*, 2014.
- Lei Liu, Yong Li, Zehan Cui, Yungang Bao, Mingyu Chen, Chengyong Wu, **Going Vertical in Memory Management: Handling Multiplicity by Multi-policy**, to appear in the *41st International Symposium on Computer Architecture (ISCA)*, 2014.
- Tianshi Chen, Qi Guo, Olivier Temam, Yue Wu, Yungang Bao, Zhiwei Xu, and Yunji Chen, **Statistical**

**Performance Comparisons of Computers**, to appear in *IEEE Transactions on Computers (IEEE TC)*, 2014.

- Zehan Cui, Licheng Chen, Yungang Bao, Mingyu Chen, **A Swap-based Cache Set Index Scheme to Leverage both Superpage and Page Coloring Optimizations**, to appear in the *Design Automation Conference (DAC)*, 2014.
- Licheng Chen, Zhipeng Wei, Zehan Cui, Mingyu Chen, Haiyang Pan, Yungang Bao, **CMD: Classification-based Memory Deduplication through Page Access Characteristics**, in the *10th ACM SIGOPS/SIGPLAN International Conference on Virtual Execution Environments (VEE)*, 2014.
- Yongbing Huang, Licheng Chen, Zehan Cui, Yuan Ruan, Yungang Bao, Mingyu Chen, **HMTT: A Hybrid Hardware/Software Tracing System for Bridging the DRAM Access Trace's Semantic Gap**, to appear in the *ACM Transactions on Architecture and Code Optimization (TACO)*, 2013.
- Licheng Chen, Yanan Wang, Zehan Cui, Yongbing Huang, Yungang Bao, Mingyu Chen, **Scattered Superpage: A Case for Bridging the Gap between Superpage and Page Coloring**, *Proceedings of the 31st IEEE International Conference on Computer Design (ICCD)*, Asheville, NC, 2013.
- Lei Liu, Zehan Cui, Mingjie Xing, Mingyu Chen, Yungang Bao, Chengyong Wu, **A Software Memory Partition Approach for Eliminating Bank-level Interference in Multicore System**, *The Twenty-First International Conference on Parallel Architectures and Compilation Techniques (PACT)*, 2012.
- Yongbing Huang, Zehan Cui, Licheng Chen, Wenli Zhang, Yungang Bao, Mingyu Chen, **HaLock: Hardware-Assisted Lock Contention Detection in Multithreaded Applications**, *The Twenty-First International Conference on Parallel Architectures and Compilation Techniques (PACT)*, 2012.
- Pengfei Zhu, Mingyu Chen, Yungang Bao, Licheng Chen, and Yongbing Huang, **Trace-driven Simulation of the Memory System Scheduling in Multithread application**, *ACM SIGPLAN Workshop on Memory Systems Performance and Correctness (MSPC) co-located with PLDI*, 2012.
- Licheng Chen, Zehan Cui, Yongbing Huang, Yungang Bao, Guangming Tan, Mingyu Chen, **A Lightweight Hybrid Hardware/Software Approach for Object-Relative Memory Profiling**, *IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)*, New Brunswick, NJ, April 1-3, 2012.
- Erlin Yao, Yungang Bao, Mingyu Chen, **What Hill-Marty model learn from and break through Amdahl's law?**, *Information Processing Letters (IPL)*, 2011.
- Guangming Tan, Linchuan Li, Sean Triechler, Everett Phillips, Yungang Bao, Ninghui Sun, **Fast Implementation of DGEMM on Fermi GPU**, *Proceedings of the ACM/IEEE SC2006 Conference on High Performance Networking and Computing (SC)*, 2011.
- Zehan Cui, Yan Zhu, Yungang Bao and Mingyu Chen, **A Fine-grained component-level power measurement method**, *The First International Workshop on Power Measurement and Profiling (PMP 2011) in conjunction with IEEE IGCC*, 2011.
- Licheng Chen, Yongbing Huang, Yungang Bao, Onur Mutlu, Guangming Tan, Mingyu Chen, **Poster: Revisiting virtual channel memory for performance and fairness on multi-core architecture**, *Proceedings of the 25th International Conference on Supercomputing (ICS)*, 2011.
- Dan Tang, Yungang Bao, Weiwu Hu, Mingyu Chen, **DMA Cache: Using On-Chip Storage to Architecturally Separate I/O Data from CPU Data for Improving I/O Performance**, *The 16th IEEE International Symposium on High-Performance Computer Architecture (HPCA-16)*, 2010.
- Erlin Yao, Yungang Bao, Guangming Tan, Mingyu Chen, **Extending Amdahl's Law in the Multicore Era**, *ACM SIGMETRICS Performance Evaluation Review*, Volume 37, Issue 2, September 2009.

- Qingbo Yuan, Yungang Bao, Mingyu Chen, Ninghui Sun: **A Scalability Analysis of the Symmetric Multiprocessing Architecture in Multi-Core System**. *The 2009 IEEE International Conference on Networking, Architecture, and Storage (NAS'09)*, 9-11 July 2009.
- Dan Tang, Yungang Bao, Yunji Chen, Weiwu Hu, Mingyu Chen, **Exploiting the Produce-Consume Relationship in DMA to Improve I/O Performanc**, *Workshop on The Influence of I/O on Microprocessor Architecture (IOM-2009) in conjunction with the 15th International Symposium on High-Performance Computer Architecture (HPCA-15)*, Raleigh, North Carolina, February 15, 2009.
- Yungang Bao, Mingyu Chen, Yuan Ruan, Li Liu, Jianping Fan, Qingbo Yuan, Bo Song, Jianwei Xu, **HMTT: A Platform Independent Full-System Memory Trace Monitoring System**, *International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS'08)*, Annapolis, Maryland, USA, June 2-6, 2008.
- Yungang Bao, Mingyu Chen, Jianping Fan, **A Virtual Channel Mechanism for Memory Controller Design in the Multicore Era**, *Thirteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'08 poster)*, Seattle, WA, USA, March 1-5, 2008.
- Li Liu, Mingyu Chen, Yungang Bao, Jianwei xu, Jianping Fan, **A Network Memory Architecture Model and Performance Analysis**, *The 2008 IEEE International Conference on Networking, Architecture, and Storage (NAS'08)*, June 12-14, 2008.
- Yuan Ruan, Yungang Bao, Mingyu Chen, Jianping Fan, **The Design and Implementation of MTT -- A Hardware-based Memory Trace Tool**, *Acta Electronica Sinica (Chinese Journal of Electronics)*, Aug. 2008 Vol.36 No.8.
- Yungang Bao, Jianwei Xu, Mingyu Chen, Jianping Fan, **Study and Development of A Novel Computer Architecture Simulator**, *Journal of System Simulation (in Chinese)*, 2007 Vol.19 No.7.
- Jianwei Xu, Mingyu Chen, Yungang Bao, **The Study on Prefetching of Remote Memory Architecture**, *Computer Science (in Chinese)*, 2005 Vol.32 No.8 P.15-20.
- Haiyun He, Yungang Bao, Chunfeng Yuan, **Semiautomatic Extract Technology of Semantic Relation of Domain-specified Concepts**, *Computer Engineering (in Chinese)*, 2005 Vol.31 No.18 P.68-70, 118.

## PROFESSIONAL SERVICES

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### Recent Services:

- PC Member: ISCA 2018, ASPLOS 2018, ISPASS 2018, RISC-V 2017 Fall , ASPLOS 2017, IISWC 2017, APSys 2017, ASPLOS 2016, SC 2016, APSys 2016, ICS 2016, ICS 2015, IISWC 2014
- Program Co-Chair: Workshop on Architectures and Systems for Big Data (ASBD), 2014/2015/2016
- Program Co-Chair: The 5<sup>th</sup> Asia-Pacific Workshop on System (APSys), 2014.
- General Chair: ChinaSys 2013.
- Program Co-Chair: The 2nd InteThe First International Workshop on Power Measurement and Profiling (PMP), 2012.

### Previous Services:

- The 1st InteThe First International Workshop on Power Measurement and Profiling (PMP), 2011, Program Committee
- IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA), 2011, Program Committee
- International Conference on High Performance Computing (HiPC), 2011, External Reviewer

- National Natural Science Foundation of China (NSFC), 2010, Reviewer
- IEEE Transactions on Parallel and Distributed Systems (TPDS), Reviewer
- Journal of Parallel and Distributed Computing (JPDC), Reviewer
- International Conference on Supercomputing, ICS-2010, External Reviewer
- SC'09 External Reviewer
- SC'08 External Reviewer
- HPC-Asia'05 External Reviewer

## **AWARDS**

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- Outstanding Researcher *Institute of Computing Technology, China, 2014*
  - **CCF-Intel Young Faculty Research Program** *CCF-Intel, 2013*
  - **The 2<sup>nd</sup> Prize Best Paper Award,** *Institute of Computing Technology, China, 2010*
  - **The 1<sup>st</sup> Prize Best Paper Award,** *Institute of Computing Technology, China, 2008*
  - **The Excellent Student Award ,** *Chinese Academy of Sciences, China, 2006*
  - **People scholarship** (The 3<sup>rd</sup> prize), *Nanjing University, China, 2002*
  - **The Excellent Student Award** (Top 5%), *Nanjing University, China, 2002*
  - **People scholarship** (The 2<sup>nd</sup> prize), *Nanjing University, China, 2000*
  - **The Excellent Student Award** (Top 6%), *Department of Computer Science and Technology, Nanjing University, China, 2001*
  - **The Excellent Paper Award** (The 3<sup>rd</sup> prize), *Nanjing University, China, 2000*
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