

Phani Kishore Gadepalli

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Summary Detail-oriented, quality-conscious software engineer and a systems hacker with over 12 years of industry experience and a doctorate in real-time operating systems. Strong interpersonal skills with a proven track record in mentoring, leading a team, and maintaining a strong and positive relation with all stakeholders in a project.

Education **George Washington University**, Washington, DC Aug 2015 – Aug 2020
PhD, Computer Science GPA: 3.89
Advisor: Prof. Gabriel Parmer

- *Thesis Title: Predictable Isolation and Communication Support for Embedded and Real-Time Systems*
- *Research Interests: Real-Time and Embedded Systems, Cloud and Edge Computing, Virtualization, Parallel Systems, Serverless Computing.*

Rashtreeya Vidyalaya College of Engineering, Bangalore, India
BE, Computer Science and Engineering Aug 2003 – May 2007
GPA: 3.68

Experience **Over 12 Years of Industry experience**

VMware by Broadcom. Software Engineer
3401 Hillview Ave, Palo Alto, CA 94304 Sep 2020 – Present
USA

Design and development of novel CPU and NUMA scheduling techniques in the ESXi kernel for managing both the real-time and general purpose workload running in the virtual machines. Working with multiple engineering teams to design, implement and deliver new products based on the enterprise class vSphere virtualization platform. Working on implementation of advanced kernel-level resource management features, with emphasis on scalability, performance, reliability and support of new hardware technologies. Continuously maintain the quality of the ESXi kernel by debugging issues for different customers and internal issues in various components in the VMKernel including CPU scheduling. Lead and mentor engineers and be a key technical resource for CPU and NUMA scheduling areas. **Projects:**

- *Virtual simultaneous multi-threading*
- *Cache isolation and virtualization*
- *Load balancing vCPUs and scalability on modern processors*
- *Retire the worldlet functionality across ESXi kernel*
- *A roadmap planning of current and future visionary work for the team, based on newer hardware trends of higher cores, NUMA technologies, and workloads like AI/GenAI requirements*
- *Redesign work conservation algorithm in ESXi to cater to increasingly larger cores per socket processors from Intel and AMD*

Arm Inc. Research Intern
150 Rose Orchard Way, San Jose, CA May 2019 – Aug 2019
95134 USA

Conducted an extensive survey of existing virtual machine and container-based serverless technologies. Designed and developed a WebAssembly-based serverless runtime from scratch during the internship and published a paper at SRDS'19 with the survey and initial results for our serverless runtime.

Toshiba Software India Pvt. Ltd.
3A Essae Vaishnavi Solitaire, 3rd Block
Koramangala, Bangalore 560034, India

System Analyst
Aug 2007 – Jul 2015

Designed and developed the system layer providing communication, synchronization and storage functionality on multi-functional peripherals (copy machines). Developed a through understanding of various layers, debugged and proposed crucial design changes to improve performance and maintain stability in a massive code base. Developed and maintained features in Linux kernel and board support packages for different multi-functional peripheral models. Consistently exceeded performance requirements in all half-yearly appraisals. Trained many new joiners, managed a team of 12 people (including members senior to me), and delivered robust and high quality software with a customer-first attitude. I was assigned onsite co-ordination engineer to Toshiba TEC, Mishima, Japan for about 3 years where I was involved in requirement gathering, high and low-level design, development, testing and debugging QA and field issues.

Projects:

- *Linux Platform Development for Different models of Multi-functional Peripherals:* Customization and maintenance of the U-boot/Linux Kernel/Root file system of the various models of Multi-functional Peripherals. Development of the new features for differential software update, defragmentation, file system check/recovery and various other features and boot modes in the busybox. Performance analysis and improvement, Investigation and debugging the issues reported.
- *Z-MODE emulation and SAP PVP certification for Barcode printers*
- *Bluetooth 2.1+EDR module support for portable Barcode printers*
- *WLAN module 802.11b/g/n support for portable Barcode printers*
- *MIB (Management Information Base) and SNMP support for Barcode printers*
- *Printer tool network software update for Barcode printers*
- *MFP common driver to configure various hardware components on Multi-functional peripherals*
- *Control panel hardware emulation for Multi-functional Peripherals for research purposes*
- *Software and firmware upgrade from GUI and over network on MFPs*
- *Common Infrastructure (CI) layer design and development for Multi-functional Peripherals:* Components include CODECs (MIME Parser, Base64 encoding/decoding, Character set encoding), DataStreams, DataTransformation, DocumentStore, BoxDocument, HierarchicalDB (DOM Parser), IndexedDB (SRAM/NVRAM area), RelationalDB (sqlite3 open source), ServiceStartupManager (MFP services manager), SystemResourceManager (MFP system resource manager).

Positions held:

- Trainee Engineer, Aug 2007-Jan 2008
- Associate Software Engineer, Feb 2008-Mar 2010
- Onsite Engineer, Toshiba TEC Japan, Aug 2008-Feb 2009
- Onsite Engineer, Toshiba TEC Japan, Jun 2009-May 2010
- Software Engineer, Apr 2010-Mar 2012
- Onsite Engineer, Toshiba TEC Japan, Mar 2012-Mar 2014
- Senior Software Engineer, Apr 2012-Mar 2014
- System Analyst, Apr 2014-Jul 2015
- **Phani Kishore Gadepalli**, Xunjia Lu, James Kenneth White, Sam Scalise. 2022. "Virtualized Cache Allocation In a Virtualized Computing System" filed July 20, 2022. *Patent pending.*

Patents

Publications & Research

My research is focused on building systems and I was the primary researcher on the design and implementation of the scheduling, temporal isolation, and multi-core management mechanisms in the Composite μ -kernel, and of the Sledge, WebAssembly-based serverless runtime.

- Samuel Jero, Juliana Furgala, Runyu Pan, **Phani Kishore Gadepalli**, Alexandra Clifford, Bite Ye, Roger Khazan, Bryan C. Ward, Gabriel Parmer, Richard Skowrya, “Practical Principle of Least Privilege for Secure Embedded Systems” at IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) 2021.
- **Phani Kishore Gadepalli**, “Predictable Isolation and Communication Support for Embedded and Real-Time Systems”, PhD Dissertation 2020.
- **Phani Kishore Gadepalli**, Sean McBride, Gregor Peach, Ludmila Cherkasova, Gabriel Parmer, “Sledge: a Serverless-first, Light-weight Wasm Runtime for the Edge”, in Proceedings of the ACM/IFIP Middleware Conference (Middleware), 2020
- **Phani Kishore Gadepalli**, Runyu Pan, Gabriel Parmer, “Slite: OS Support for Near Zero-Cost, Configurable Scheduling” at IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) 2020, won the **Distinguished Paper** award.
- **Phani Kishore Gadepalli**, Gregor Peach, Ludmila Cherkasova, Rob Aitken, Gabriel Parmer, “Challenges and Opportunities for Efficient Serverless Computing at the Edge”, in 38th International Symposium on Reliable Distributed Systems (SRDS), 2019
- **Phani Kishore Gadepalli**, Gregor Peach, Gabriel Parmer, Joseph Espy, Zachary Day, “Chaos: a System for Criticality-Aware, Multi-core Coordination” at IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) 2019 and presented at the conference in Montréal, Canada.
- Gabriel Parmer, Runyu Pan, Yuxin Ren, **Phani Kishore Gadepalli**, Wenyan Shao, “Component-based OS Design for Dependable Cyber-Physical Systems”, in Proceedings of the 1st International Workshop on Next-Generation Operating Systems for Cyber-Physical Systems (NGOSCPS), 2019
- **Phani Kishore Gadepalli**, Robert Gifford, Lucas Baier, Michael Kelly, Gabriel Parmer, “Temporal Capabilities: Access control for time” at IEEE Real-Time Systems Symposium (RTSS) 2017 and presented at the conference in Paris, France.

I participated in journal review for ACM TECS 2022, and I am serving as a Program Committee for RTAS 2023 conference. I contributed as a secondary reviewer in EMSOFT 2017/2018/2019, and RTAS 2018.

Research Projects

Practical Principle of Least Privilege for Secure Embedded Systems

- Built arm32 user-level plumbing for Composite’s thread-migration-based synchronous IPC used in cosrt, and improved Composite kernel for arm32 architecture.
- Micro-optimized the IPC path for arm32 both at user and kernel level to significantly improve the OS primitives costs.

Sledge: an Efficient Serverless WebAssembly Runtime for the Edge

- Built the single process WebAssembly function runtime with preemption capabilities for multitenant function isolation and integrated with scalable work-stealing deque and *libuv* event-driven I/O.
- Ported the sandbox preemption and scheduling functionality to AArch64 (on Raspberry Pi).

Slite: OS Support for Near Zero-Cost, Configurable Scheduling

- Built kernel and user-level scheduling mechanism to share pages between them to track a minimal trusted-control block (TCB) necessary to track thread execution, and active thread at the user-level for lazy-incoherence.
- Built common OS primitives like message queues and locks at user-level leveraging the near zero-cost user-level thread switches and a parallel runtime that integrates tasks with thread based scheduling using work-stealing deque for work-conserving parallel execution in OpenMP.

Chaos: a System for Criticality-Aware, Multi-core Coordination

- Built the minimal ChaosRT runtime for predictable execution of high-criticality tasks and proxies for inter-assurance coordination leveraging synchronous or asynchronous coordination techniques in Composite kernel.
- Built the IPI rate-limiting servers for controlled interference from low-assurance software on the high-criticality tasks and the polling mechanism to process the requests for dropped IPIs.
- Implemented NASA's core Flight System (cFS) in Chaos by devirtualizing different cFS, OpenSatKit applications and the safety controller application and enabled proxies between them and cFS or NetBSD drivers for leveraging the functionality from these subsystems.

Temporal Capabilities (TCaps): Access control for time

- Built the TCap capability mechanism in the kernel to track the timeslice and array of priorities from various TCap delegations with each TCap.
- Built a hypervisor with user-level scheduling to accurately track and replenish the budgets of different user VMs in the virtualization environment.
- Modified the Rumpkernel unikernel (NetBSD drivers) to leverage Composite user-level scheduling library and enabled inter-VM coordination between user and driver VM to leverage the TCap inter-scheduler delegation to pass time for request processing.

Computer Skills

Languages:

- *Proficient:* C, C++.
- *Familiar:* Rust, WebAssembly, Java, Bash, Python, XML.

Software:

- *Platforms:* Linux (various flavors), Microsoft Windows, Android, VMware ESXi hypervisor
- *Embedded Platforms:* Composite, Linux RT, Fiasco.OC, seL4, VxWorks, μ Ittron.
- *Tools:* GCC/Clang, GIT, GDB, Docker, WindRiver Workbench, JTAG emulators, Perforce, Parasoft, Bugzilla, Perforce, Reviewboard.

Awards & Honors

- Distinguished Paper Award at the 26th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Sydney Australia in 2020.
- IEEE Student Member 2017-2020
- Fellowship and Research assistantship awards at the George Washington University (2015-2020)
- Consistently rated as 'Exceeding Requirements' in all half-yearly appraisals in Toshiba Software India Pvt. Ltd.
- Awarded in recognition for Process Innovation as an Organizational Best Practice in 2011 and 2012 at Toshiba Software India Pvt. Ltd.
- Participated in various Intra-Company Table Tennis Tournaments and was selected among Top 8 from the company to participate in Bangalore Opens in 2011.

- Participated in Intra-Company Cricket tournaments and won the tournament at Toshiba Software India Pvt. Ltd. in 2011.
- Awarded Certificate of Achievement for Excellent Efforts and contribution to eBX MFP Software Development in 2011 at Toshiba Software India Pvt. Ltd.
- Member of Organizing Committee of 20th CSI Karnataka Student Convention held under joint auspices of RVCE and CSI Bangalore Chapter in Oct, 2006.
- Member of Organizing Committee of SAHYADRI UTSAVA fest by KANNADA SANGHA, RVCE in 2005.
- Member of Organizing Committee of IOTA '03 - '07, an inter-collegiate Symposium of CSE, RVCE.
- Member of Computer Society of India (CSI), Vritanth (CSE club of RVCE) and RAAG '03 - '07.
- Participated in Counter Strike Condition Zero Computer Gaming contests at various inter-collegiate technical fests (2005-2006) from RVCE.
- Won second prize in Mathematics quiz in 12th grade.
- Won Man of the Series award in Cricket competition held in 12th grade.
- Participated in Science competitions like CHETANA and mathematics competitions like Mathematical Olympiad in elementary and secondary schools.
- Secured First class in State Level Science Talent Examination 1998-99 by PUTANI VIGNAANA.