Sundaram Ananthanarayanan

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Summary

An infrastructure engineer with great passion for performance and scalability. Most recently I have been working on a highly scalable, low-latency stateful task execution system that handles Uber's CI workloads. Before that, I researched extensively on techniques to guarantee ACID like properties for large monorepos and built a state-of-the-art change management system utilized by 3000+ services and 10+ apps at Uber.

Education

- **Stanford University** — Stanford, CA
  Master of Science in Electrical Engineering; GPA: 3.9/4.0 — *Sep. 2012 – Jun. 2014*
- **College of Engineering, Guindy, Anna University** — Chennai, India
  Bachelor of Engineering in Information Technology; GPA: 9.32/10.0 — *Aug. 2008 – June. 2012*

Working Experience

- **Uber** — San Francisco, CA
  Senior Software Engineer II — *May 2016 - Present*
  - **SubmitQueue**: 1000s of engineers committing changes concurrently to a repository leads to frequent master breakages. Explored & conceived a new system called *SubmitQueue* that guarantees an **always-green** master at scale. At Uber, *SubmitQueue* handles 1000s of commits/hr submitted by 1000s of engineers every day.
    - Led a team of 5 engineers to build the system: reading papers on state-of-the-art techniques used in similar domains such as Databases, experimented with various approaches to find a scalable solution, & architected the system to handle 1000s of changes/hr.
    - Improved the shippability of an average service from *52% to 100%* while keeping the maximum overhead at 20 minutes to commit a change.
    - Published a research paper presenting the design & implementation of *SubmitQueue* at **Eurosys'19**. Adrian Coyler has covered it as part of *the morning paper*.
  - **uCI**: Because existing open-source CI systems such as Jenkins do not scale to Uber's needs, I conceived & designed *uCI*- a large-scale distributed system to handle reliable execution of millions of stateful tasks every day on 1000s of CI machines.
    - Leading a team of 6 engineers to design a state-of-the-art cluster scheduler that handles faults gracefully (*reliability*), exploits data locality to come up with optimal placements (*performance*), scales horizontally on every layer (*scalability*), and finally guarantees isolation at task/resource levels.
    - Designed the system leveraging existing open-source technologies such as Apache Mesos for cluster management, Cadence for workflow orchestration & Docker for executing tasks in a containerized environment.
    - Sped up build times for Android CI workflows by 4-6x, reducing hour-long workflows to order of minutes.
- **Baidu Research Silicon Valley AI Lab** — Sunnyvale, CA
  Software Engineer — *Jan 2016 - May 2016*
  - **Speech Infrastructure**: Designed & productionized deep-learning based Speech Recognition APIs which power Android apps such as TalkType. Also worked on infrastructure that would suggest words as you speak (e.g, world level suggestion [word, wide]) .
- **Twitter Inc** — San Francisco, CA
  Software Engineer — *Jun 2014 - Jan 2016*
  - **AddressBook Infrastructure**: System for storing, retrieving contacts stored on the phone-book of Twitter's 300M+ MAUs. It was used in powering features such as *Who To Follow* aimed at user increasing engagement. Designed a scalable offline infrastructure that periodically reconciled the 1PB+ HDFS snapshot with updates in minutes by making use of algebraic structures such as Monoids.

Ancient History

- **Microsoft** — Redmond, WA
  Software Engineering Intern, Kernel Core Team — *Jun 2013 - Sep 2013*
- **Google Summer of Code** — Chennai, India
  Worked on Metalink Support for Google Chrome — *Jun 2012 - Sep 2012*
- **University of Waterloo** — Waterloo, Canada
  Research Intern - Worked on design & application of One-Instruction Processors — *Apr. 2011 – June. 2011*

Selected Publications

[1] **Sundaram Ananthanarayanan**, Masoud Saeida Ardekani, Denis Haenikel, Balaji Varadarajan, Simon Soriano, Dhaval Patel, and Ali-Reza Adl-Tabatabai. "Keeping Master Green at Scale". In: *Proceedings of the Fourteenth EuroSys Conference 2019, Dresden, Germany, March 25-28, 2019*. 2019, 29:1–29:15. DOI: 10.1145/3302424.3303970. URL: https://doi.org/10.1145/3302424.3303970.

[2] Dario Amodei, **Sundaram Ananthanarayanan**, et al. "Deep Speech 2 : End-to-End Speech Recognition in English and Mandarin". In: *Proceedings of the 33nd International Conference on Machine Learning, ICML 2016, New York City, NY, USA, June 19-24, 2016*. 2016, pp. 173–182. URL: http://proceedings.mlr.press/v48/amodei16.html.

[3] **Sundaram Ananthanarayanan**, Siddharth Garg, and Hiren D. Patel. "Low cost permanent fault detection using ultra-reduced instruction set co-processors". In: *Design, Automation and Test in Europe, DATE 13, Grenoble, France, March 18-22, 2013*. 2013, pp. 933–938. DOI: 10.7873/DATE.2013.196. URL: https://doi.org/10.7873/DATE.2013.196.

[4] Aravindkumar Rajendiran, **Sundaram Ananthanarayanan**, Hiren D. Patel, Mahesh V. Tripunitara, and Siddharth Garg. "Reliable computing with ultra-reduced instruction set co-processors". In: *The 49th Annual Design Automation Conference 2012, DAC '12, San Francisco, CA, USA, June 3-7, 2012*. 2012, pp. 697–702. DOI: 10.1145/2228360.2228485. URL: https://doi.org/10.1145/2228360.2228485.

Selected Talks

- **Keeping Master Green at Scale**
  - Slides: https://sundaram.io/slides/submitqueue.pdf
  - *Google Journal Club, May 2019* — San Francisco, CA
  - *Eurosys'19, March 2019* — Dresden, Germany
  - *Facebook, Jan 2019* — Menlo Park, CA

Skills

- **Languages**: Java, Scala, C++, Bash, SQL
- **Specialities**: distributed systems, graph theory, algorithms, machine learning, performance tuning and debugging