Benjamin Bannier

Professional experience

10/2015–present Senior software engineer, Mesosphere GmbH, Hamburg, Germany

Mesosphere with major offices in San Francisco, USA and Hamburg, Germany develops the Datacenter Operating System (DC/OS) which abstracts away compute infrastructure.

As an Apache Mesos committer, my work is primarily related to the Apache Mesos project which provides the DC/OS backplane. My focus is mainly on open source work in the Apache Mesos community which in addition to Mesosphere employees includes contributors from e.g., Apple, Microsoft, or Twitter. Apache Mesos follows the *Apache Way* with open discussions, design processes, and reviews.

Additionally, I am involved in the design of DC/OS components and more generally in reviews of distributed systems aspects of other DC/OS components.

III/2017–present Support for the Container Storage Interface (CSI) in Apache Mesos.

I work as a tech lead for storage aspects in Mesos and designed and lead the implementation of local resource providers in a tight time budget. This involved developing architectures for performant and failsafe state transitions in a large distributed system.

As a Mesos committer I interface Mesosphere's asks for Mesos with the needs and processes of the open-source community, participate in public design processes and consensus building.

I provide guidance and mentoring for internal and external customers of Mesos or DC/OS on how to interface their business-specific code, and on how to develop scalabe distributed systems in general.

I work with product management to translate their customer requirements to actual architecture and own the implementation.

I mentor a number developers on my team and outside my team and am involved in hiring for the company.

III/2017 Elected Apache Mesos committer and PMC member.

I/2017–II/2017 Implementation and design of Linux capabilities and `rlimits` support for the Apache Mesos containerizer.

Mesos provides a custom container rumtime to isolate and monitor workloads. I provided APIs for enhanced control over a workload's access to kernel APIs and system resources.

II/2016–III/2016 Strict authentication and authorization support in Mesos.

I designed and implemented proprietary Apache Mesos plugins for authentication (authn) and authorization (authz) support for operations against both internal and external Apache Mesos APIs. This involved broad cleanups of Apache Mesos APIs to enable authn and authz support, design and implementation of filtering on HTTP APIs, and the design of the Mesos access control lists.

The plugins interface with DC/OS IAM services over HTTP. Due to the potentially large scale of DC/OS installation special care was needed to implement caching and correct backoff schemes in line with the requirements (e.g., response times, authn and authz lifetimes).

IV/2015–I/2016 Work on multitenancy support.

I designed and prototyped support for hierarchical roles and multiple roles for Apache Mesos frameworks. This involved discovery with internal stackholders and an open design process with the community.

06/2014-–09/2015 Senior software developer, ParStream GmbH (acquired by Cisco), Hamburg, Germany

ParStream developed a low latency distributed SQL-"Big Data" database. The core database is developed exclusively in C++ with auxiliary tools being developed in e.g., Python.

Due to the strong emphasis on performance the core database makes heavy use of multithreading and is often highly asynchronous (e.g. via Boost.Asio), all while providing the expected consistency guarantees. Since nodes in the cluster are physically distributed special care is required when modelling globally visible state.

II/2015 I lead a team delivering tools for integrating external data processing tools like R or Python into the core execution engine, and oversaw and coordinated all phases of the project from R & D and product design in collaboration with Product Management, through functional & technical design to implementation, internal QA and delivery.

I introduced and developed static analysis tools based on the clang AST which are now part of the regular CI build.

IV/2014 I delivered tools for cluster management which allow to change the state of a ParStream cluster from any node with fully transparent distribution and persistence.

Selected presentations

- *Provisioning storage for stateful services with CSI and Mesos*, with J. DeFelice, C. H. Hsiao, J. Schlicht, MesosCon North America, San Francisco, November 2018.
- *Apache Mesos: Orchestrating Container and Big Data*, Apache Roadshow, Berlin, Germany, June 2018
- *Bringing containers to the enterprise*, with S. Brahmaroutu, J. Guo, MesosCon Asia, Hangzhou, China, November 2016
- *An introduction to the Mesos framework zoo*, MesosCon Asia, Hangzhou, China, November 2016
- *Mesos, DC/OS and the Architecture of the New Datacenter*, Cloud native meetup Munich, Germany, May 2016

Languages

German native speaker
English fluent
French, Modern Greece basic knowledge
C++, Python, Rust, `sh` dialects currently used
Go, SQL, Haskell, Perl, `sed`, `awk` working knowledge

Interests

- distributed systems
- functional patterns
- static code analysis, automated refactoring tools

Formal education

09/2007–05/2014 PhD (Physics), Stony Brook University, USA.

PhD studies in Physics under Professor Axel Drees

Measurement of direct photons in Au+Au collisions at $\sqrt{s} = 200\,GeV$ *at RHIC*

- measurement of photon production in heavy ion collisions with the PHENIX detector
- production and analysis of PB-scale experimental data sets
- development of Monte Carlo tools
- work on fully automated detector recalibration algorithms
- development of custom analysis and simulation software in e.g. C++, Python or FORTRAN in a large, multi-national collaboration using among others ROOT, numpy, scipy, GEANT3/4, TMVA
- use and development of heavily optimized mathematical software with simultaneously strong requirements on performance, reliability as well as maintainability
- Tutoring on best practices e.g. invited talk at CERN ROOT workshop on Modern C++ techniques and responsibility for maintaining a high level of quality in our large codebase

08/2001–01/2007 Technical University of Dresden, Germany

Diplom Physics, final grade 1.15.

Thesis topic: *Simulations of Dielectron Detection Capabilities of HADES at SIS100.*

- Intermediate-scale Monte Carlo modelling of particle production and transport in Heavy Ion collisions.

09/2003–04/2004 *Research assistant*, National Technical University of Athens, Greece.

Measurements and numerical modelling of the response of ATLAS Monitored Drift Tubes, with Professor Theodore Alexopoulos. Funded by a grant from the EU Erasmus Programme.

08/1993–06/1999 Gymnasium Fridericianum Schwerin, Germany

- Abitur with majors in Mathematics and Physics, final grade 1.8.

Academic publications

- B. Bannier, *Measurements of direct photons in Au+Au collisions with PHENIX*, Nucl.Phys. A932 (2014) 212-217

- B. Bannier, *Systematic studies of the centrality dependence of soft photon production in Au+Au collision with PHENIX*, Nucl.Phys. A931 (2014) 1189-1193.
- A. Adare, et al, *Centrality dependence of low-momentum direct-photon production in Au+Au collisions at* $\sqrt{s_{_{NN}}} = 200\ GeV$, arXiv:1405.3940, 2014, submitted to PRC
- *Elliptical and triangular flow of soft direct photons in Au+Au collisions at* $\sqrt{s_{NN}} = 200\ GeV$, in preparation

Academic conference presentations and posters

- *Systematic studies of the centrality dependence of soft photon production in Au + Au collision with PHENIX*, poster presented at Quark Matter 2014, selected for a flash talk, Darmstadt, Germany.
- *Experimental Results from PHENIX*, talk at Symposium of the EMMI Rapid Reaction Task Force *Direct-Photon Flow Puzzle*, February 2014, Darmstadt, Germany.
- *Measurements of direct photons in Au+Au collisions with PHENIX*, talk at Hard Probes 2013, Stellenbosch, South Africa.
- *ROOT and C++11*, invited talk at ROOT Users Workshop 2013, Saas Fee, Switzerland.
- *Measurements of low-momentum thermal photons in Au+Au collisions with the PHENIX detector*, poster at Quark Matter 2012, Washington, USA.
- *Dielectron detection capabilities of HADES at SIS100/300*, talk at DPG Frühjahrstagung Hadronen und Kerne 2007, Gießen, Germany.

Awards

- RHIC & AGS thesis award, 2015