

Weak models of data consistency

Subject

We are trying to make the Cloud a safer and saner place to live. To do so, we have writing a full operating system in OCaml, dubbed "Mirage" [3] which compiles complex applications to single, sealed, hyper-specialized and self-contained virtual machines (or "unikernels") that can be easily deployed on any Public Cloud. These unikernels are safer than usual Virtual Machines based on standard application stacks (such as LAMP: Linux+Apache+Mysql+PHP), as they are written in a high-level language with strong static typing guarantees, with lots of whole-program analysis and optimizations done at compile-time – and they are as efficient as their counterparts as the small penalty of using a high-level language is balanced by the removal of all the legacy layers embedded in more standard operating systems .

We are now focusing on new programming techniques and language constructs to be used to coordinate hundreds thousands of such unikernels. The first thing we are looking at is a weakly consistent persistence layer, where each unikernel can partially read and write data in an efficient and safe way. We already have a basic implementation of this layer based on an extension of Concurrent Revision [1] and we are starting to play with functional reactive programming [2] to orchestrate collections of unikernels at such scales.

The objective of this internship is to formalize the persistence layer that we are developing and to transform the existing prototype into something which can scale and be used more pervasively. It is also possible to orient the internship towards the design of orchestration layer if the candidate is also interested in that part. The internship will take place in the Computer Laboratory in Cambridge, UK.

References

- [1] Sebastian Burckhardt and Daan Leijen. Semantics of concurrent revisions. In *ESOP*, 2011.
- [2] Conal Elliott and Paul Hudak. Functional reactive animation. In *ICFP*, 1997.
- [3] Anil Madhavapeddy, Richard Mortier, Charalampos Rotsos, David Scott, Balraj Singh, Thomas Gazagnaire, Steven Smith, Steven Hand, and Jon Crowcroft. Unikernels: library operating systems for the cloud. In *ASPLOS*, 2013.

Profil

The successful candidate will have a background in Computer Science, with a strong interest in Operating Systems and/or Functional Programming. A working knowledge of OCaml and a taste for writing software would certainly be a plus, as we expect the candidate to become part of the Mirage development team.

Contact

For any question, please contact `thomas.gazagnaire@cl.cam.ca.uk`.

- Mirage OS: <http://www.openmirage.org>
- OCaml Labs: <http://ocaml.io>