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New directions in OS design, and the Barrelfish research operating system

It is now widely acknowledged that we are facing a qualitative change in the hardware that mainstream, general-purpose operating systems (whether for servers, desktops, laptops, or phones) must support. In this talk, I will talk about the challenges that operating systems face in the coming years - not only scalability with core count, but also the less-widely recognized question of system diversity and heterogeneity. In the Barrelfish project, a collaboration between the Systems Group at ETH Zurich and Microsoft Research, we are building a new, open-source research operating system from scratch in order to see how a clean-slate design can meet these challenges. I will describe how Barrelfish in particular employs two key concepts in OS design: a "multikernel" architecture where the OS for a single machine is nevertheless built as a distributed system, and the use of a powerful logic reasoning engine at runtime to adapt to, and efficiently exploit, diverse hardware without refactoring the OS.