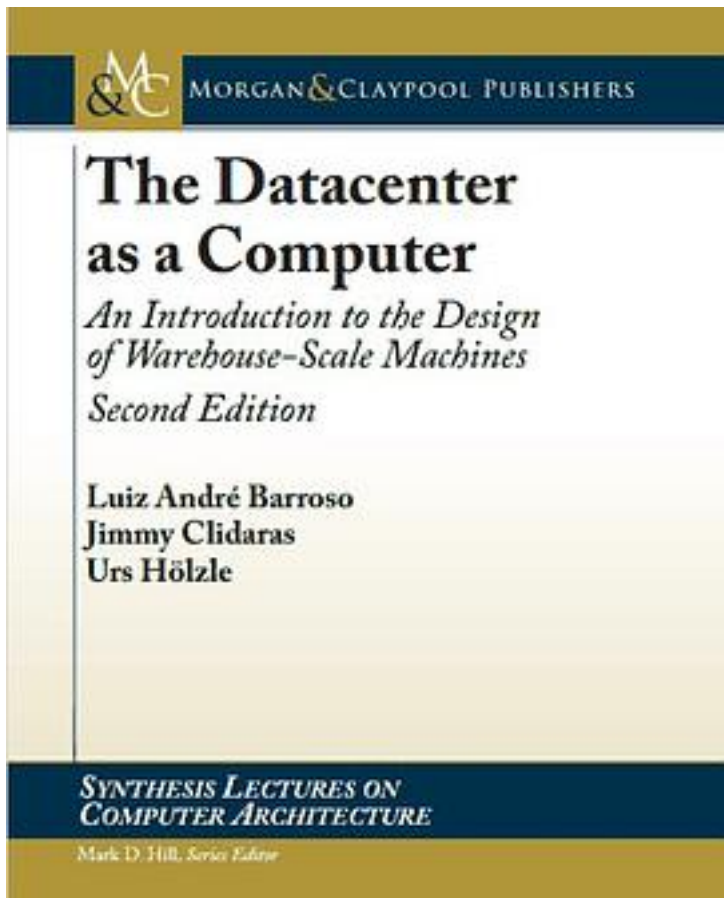


# The Datacenter as a Computer



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The Datacenter as a Computer: An Introduction to the Design of Warehouse-Scale Machines, Second edition

Synthesis Lectures on Computer Architecture

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Abstract

As computation continues to move into the cloud, the computing platform of interest no longer resembles a pizza box or a refrigerator, but a warehouse full of computers. These new large datacenters are quite different from traditional hosting facilities of earlier times and cannot be viewed simply as a collection of co-located servers. Large portions of the hardware and software resources in these facilities must work in concert to efficiently deliver good levels of Internet service performance, something that can only be achieved by a holistic approach to their design and deployment. In other words, we must treat the datacenter itself as one massive warehouse-scale computer (WSC). We describe the architecture of WSCs, the main factors influencing their design, operation, and cost structure, and the characteristics of their software base. We hope it will be useful to architects and programmers of today's WSCs, as well as those of future many-core platforms which may one day implement the equivalent of today's WSCs on a single board.

Notes for the Second Edition

After nearly four years of substantial academic and industrial developments in warehouse-scale computing, we are delighted to present our first major update to this lecture. The increased popularity of public clouds has made WSC software techniques relevant to a larger pool of programmers since our first edition. Therefore, we expanded Chapter 2 to reflect our better understanding of WSC software systems and the toolbox of software techniques for WSC programming. In Chapter 3, we added to our coverage of the evolving landscape of wimpy vs. brawny server trade-offs, and we now present an overview of WSC interconnects and storage systems that was promised but lacking in the original edition. Thanks largely to the help of our new co-author, Google Distinguished Engineer Jimmy Clidaras, the material on facility mechanical and power distribution design has been updated and greatly extended (see Chapters 4 and 5). Chapters 6 and 7 have also been revamped significantly. We hope this revised edition continues to meet the needs of educators and professionals in this area.

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