



"سخنرانی های علمی"

پژوهشگاه دانش های بنیادی  
پژوهشکده علوم کامپیوتر

## Precharge-Free DRAM

نظام رهبانی

پژوهشگر پسادکتر در پژوهشگاه دانش های بنیادی (IPM)

### Abstract

DRAM is the dominant technology/structure as main memory in a broad range of computing systems from high-performance computers to embedded systems. Although DRAM capacity and bandwidth have increased sharply by the advances in technology and standards, its latency and energy per access have remained almost constant in recent generations. The main portion of DRAM power/energy is dissipated by Read, Write, and Refresh operations, all initiated by a Precharge phase. Precharge phase not only imposes a large amount of energy consumption, but also increases the delay of closing a row in a memory block to open another one. By reduction of row-hit rate in recent workloads, especially in multi-core systems, precharge rate increases which exacerbates DRAM power dissipation and access latency.

In this talk we take a look at a novel DRAM structure, called Precharge-Free DRAM (PF-DRAM), that eliminates the Precharge phase of DRAM. PF-DRAM uses the charge on bitlines from the previous Activation phase, as the starting point for the next Activation. The difference between PF-DRAM and conventional DRAM structure is limited to precharge and equalizer circuitry and simple modifications in sense amplifier, which are all limited to subarray level. PF-DRAM is compatible with the mainstream JEDEC memory standards like DDRx and HBM, with minimum modifications in memory controller.

### Biography

Nezam Rohbani received his B.Sc. in computer engineering from Mazandaran University. He earned his M.Sc. focusing on energy-harvesting wireless sensor networks and his Ph.D. on aging-resistant processors from Sharif University of Technology. Now he is a senior postdoctoral researcher at Institute for Research in Fundamental Sciences (IPM), researching on low-power on-chip/off-chip memories, in-memory processing techniques, and aging assessment techniques for nano-scale chip fabrication technologies.

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