

Invited Talk 2

Proximity Communication and Time

Robert Drost and Ivan Sutherland, Sun Microsystems Laboratories

Abstract

Two integrated circuit chips placed face-to-face can communicate without direct electrical contact. The capacitive coupling between their top-level metal layers can carry data. We have demonstrated such “proximity communication” with data bits on 50 micron centers and data rates similar to on-chip wires. Such communication offers attractive speed, density, and energy economy, but requires accurate mechanical alignment. Robert Drost will summarize our work.

Proximity communication requires sensitive amplifiers to compensate for the attenuation suffered as signals pass from one chip to the other. Sensitive sampling amplifiers, such as the “regenerative sense amplifiers” found in a DRAM, distinguish between two binary states when told to act. Such amplifiers are useful for receiving the data bits in a bundled-data system in which the control signals tell them when to act. However, they are inappropriate for control signals with uncertain arrival times.

Control signals with uncertain arrival times require a different sort of amplifier; one that can distinguish between signal and no signal. The difference between receiving attenuated data signals and receiving attenuated control signals focuses attention on the fundamental problem of time in asynchronous systems. Ivan Sutherland will offer some ideas about the cost of knowing when.