

# Silicon-Interconnect Fabric is soon on its way to replace Printed Circuit Boards, new UCLA research claims

By **Sugandha Lahoti** - September 26, 2019 - 4:37 am

## 3 min read

Researchers from UCLA claim in a news study that printed circuit board could be replaced with what they call silicon-interconnect fabric or Si-IF. This fabric allows bare chips to be connected directly to wiring on a separate piece of silicon. The researchers are Puneet Gupta and Subramanian Iyer, members of the electrical engineering department at the University of California at Los Angeles.

## How can Silicon-Interconnect Fabric be useful

In a report published on IEEE Spectrum on Tuesday, the researchers suggest that printed circuit boards can be replaced with silicon which will especially help in building smaller, lighter-weight systems for wearables and other size-constrained gadgets. They write, "Unlike connections on a printed circuit board, the wiring between chips on our fabric is just as small as wiring within a chip. Many more chip-to-chip connections are thus possible, and those connections are able to transmit data faster while using less energy."

Si-IF can also be useful for building "powerful high-performance computers that would pack dozens of servers' worth of computing capability onto a dinner-plate-size wafer of silicon."

The silicon-interconnect fabric could possibly dissolve the system-on-chip (SoC) into integrated collections of dielets, or chiplets. The researchers say, "It's an excellent path toward the dissolution of the (relatively) big, complicated, and difficult-to-manufacture systems-on-chips that currently run everything from smartphones to supercomputers. In place of SoCs, system designers could use a conglomeration of smaller, simpler-to-design, and easier-to-manufacture chiplets tightly interconnected on an Si-IF."

The researchers linked up chiplets on a silicon-interconnect fabric built on a 100-millimeter-wide wafer. Unlike chips on a printed circuit board, they can be placed a mere 100 micrometers apart, speeding signals and reducing energy consumption. For evaluating the size, the researchers compared an Internet of Things system based on an Arm microcontroller. Using Si-IF shrinks the size of the board by 70 percent but also reduces its weight from 20 grams to 8 grams.

## Challenges associated with Silicon-Interconnect Fabric

Even though large progress has been made on Si-IF integration over the past few years, the researchers point out that much remains to be done. For instance, there is a need of having a commercially viable, high-yield Si-IF manufacturing process. You also need mechanisms to test bare chiplets as well as unpopulated Si-IFs. New heat sinks or other thermal-dissipation strategies will also be required to take advantage of silicon's good thermal conductivity. In addition, the chassis, mounts, connectors, and cabling for silicon wafers need to be engineered to enable complete systems. There is also the need to make several changes to design methodology and to consider system reliability.

People agreed that the research looked promising. However, some felt that replacing PCBs with Si-IF sounded overachieving, to begin with. A comment on Hacker News [reads](#), "*I agree this looks promising, though I'm not an expert in this field.*"

*But the title is a bit, well, overpromising or broad. I don't think we'll replace traditional motherboards anytime soon (except maybe in smartphones?). Rather, it will be an incremental progress."*

Others were also not convinced. A hacker news user [pointed out](#) several benefits of PCBs. "

- *PCBs are cheaper to manufacture than silicon wafers.*
- *PCBs can be arbitrarily created and adjusted with little overhead cost (time and money).*
- *PCBs can be re-worked if a small hardware fault(s) is found.*
- *PCBs can carry large amount of power.*
- *PCBs can help absorb heat away from some components.*
- *PCBs have a small amount of flexibility, allowing them to absorb shock much easier*
- *PCBs can be cut in such a way as to allow for mounting holes or be in relatively arbitrary shapes.*
- *PCBs can be designed to protect some components from static damage."*

You can read the full research on [IEEE](#).

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