



Unpacking the *Intel Unleashed* Video

By Jean S. Bozman

Intel CEO Pat Gelsinger packed a lot of information into the *Intel Unleashed – Engineering the Future* video. Packed into the first 11 minutes of the *Intel Unleashed* presentation is a wide-ranging vision of a new and emerging pattern for Intel investments, partnerships and product focus.

Clearly, the company is making deep investments in its manufacturing capacity in the U.S. and Europe – starting with a \$20 billion commitment to fund two new manufacturing facilities in Arizona. The sites will support commercial and government demand for semiconductor customization, while adding capacity in the U.S. and Europe. The investment in manufacturing sites is bound to get deeper, because Intel's plans to build more foundry sites will be announced next year.

Beyond that, the design philosophy for Intel is changing, moving from SOC point-products (system-on-chip) to flexible platforms (system on package, or SoP) that can, and will, add functionality, as customer requirements from Intel's OEMs and partners change. This approach will shorten product design cycles, and get new systems into production faster than before.

Looking Ahead

The Intel ecosystem is morphing – opening a global foundry business, even as Intel products continue to compete across many market segments, including semiconductors and memory. Some would even call it a co-opetition model.

With \$77.9 billion in FY2020 Intel revenue, Intel plans to grow its top-line revenue through longtime partnerships with hardware OEMs – and with new customers based on the newly announced Intel Foundry Services business. Gelsinger said the company sees a \$100 Billion total available market (TAM) for worldwide foundry capacity in 2025.

IDM 2.0

To implement this strategy, Intel is accelerating what it calls its Integrated Device Manufacturing 2.0 strategy (IDM 2.0). This strategy is designed to restore process performance leadership and to build on the company's 3D packaging technologies. There's a shift to packages of stacked tiles – as multiple tiles are integrated into a single Intel-branded package, or multi-chip module (MCM).



Intel will leverage its EMIB (Embedded Multi-Die Interconnect Bridge) and Foveros advanced 3D packaging to combine many tiles into a single platform. These tiles will support a variety of functions, including CPUs, GPUs, graphics, AI/ML and emerging technologies. Overall, there's a focus on dense packaging of multiple "tiles" together for customized builds for its OEM and foundry customers.

This move is very much in step with the diversity of designs emerging for specific uses and workloads across a wide variety of core-cloud-edge environments. It will bring more flexibility and granularity to Intel-manufactured semiconductor platforms, as new tiles, with new functions (e.g., tiles dedicated to graphics, AI, ML, 5G, cloud and intelligent edge), become available.

New Intel Foundry Services

Importantly, the company is starting a freestanding business unit, Intel Foundry Services, which will fabricate other companies' semiconductor designs, increasing Intel's worldwide manufacturing capacity.

This move is designed to increase the volume of Intel's overall business, attracting new customers that design semiconductors, but today have insufficient factory capacity to scale up semiconductor production. The world's biggest foundries include TSMC and UMC, Samsung and Global Foundries – and with Intel's entry, some may enter a co-opetition model, as industrial customers choose foundry partners for their next-generation chip designs. Even so, to speed production, Intel said it plans to have some of its components made at other companies' foundries.

As it grows its ecosystem, Intel will provide API tools (software) that will allow its partners to link with, and test, Intel semiconductor packages. This will speed adoption of Intel's support for a range of technologies on future platforms for foundry partners. Some of the product types mentioned include those related to x86, ARM and RISC-V designs. ARM is aimed at small form-factor mobility and consumer devices, and RISC-V is an open-source licensed technology that is growing, driven by IoT, 5G, AI and other emerging use cases for edge computing.

Partnership with IBM

Intel and IBM both announced a joint partnership for materials science. It was a jarring revelation by both companies, given the long rivalry between Intel and IBM processors in the worldwide server and storage markets. However, it is a research-centered partnership, aimed at improving U.S. competitiveness in the semiconductor process space.



Intel has not yet shipped 7nm semiconductors – but is taping them out (Meteor Lake is expected to ship next quarter (Q2 of 2021). It acknowledged a late start to using EUV (Extreme Ultraviolet) techniques as it moves from its 10nm process semiconductors to 7nm process semiconductors. Moving to EUV now will allow Intel to intercept its 2023 roadmap, with its plans to ship 7nm chips for both PC/laptop and servers platforms, Gelsinger said.

IBM will work with Intel on a new research collaboration focused on next-generation logic and packaging technology. The goal of the joint work is to accelerate innovation in semiconductor manufacturing; enhance the competitiveness of the U.S. semiconductor industry; and support key U.S. government initiatives.

IBM has been designing 7nm semiconductors – and is driving the process toward 5nm technology. IBM's 7nm chips are manufactured by Samsung. The partnership with IBM will leverage Intel resources in Hillsboro, Oregon with IBM resources that are based in an Albany, N.Y., research and testing facility that operates on a 24 x 7, round-the-clock basis.

Addressing Global Capacity

Intel plans to build new manufacturing capacity in the U.S. and Europe, starting with two new fabs in Ocotillo, AZ, near Intel's Chandler, AZ, site. Intel's initial investment in the two foundry sites, as announced, will be substantial: \$20 Billion over several years. The sites will support commercial and government demand for semiconductor customization, while adding capacity outside Asia.

Intel is committing to increasing geographic diversity by building more manufacturing capacity in the U.S. and EMEA (Europe/MiddleEast/Africa). In the video, Intel estimated that 80% of the world's semiconductor manufacturing capacity is in Asia/Pacific, while 15% is in the U.S. and 5% in EMEA.

The *Intel Unleashed* video had a number of references to the importance of addressing demand from industrial customers and government agencies that require production of products to be made in their country or region. Intel already has sites in Ireland and Israel, but will announce additional sites in 2022. Intel also has one manufacturing site in Dalian, China, and a number of customers in China, including the Baidu and Alibaba cloud services.

Back to the Future



Summing up Intel's announcements in the video, Gelsinger said the new strategy positions Intel as a provider of process technologies; a major manufacturer of semiconductors; and the leading volume provider of silicon globally.

As CEO, Gelsinger reminded viewers that he is returning to the company where he worked for more than 25 years, learning Intel's corporate culture from company co-founders Andy Grove, Gordon Bell and Robert Noyce. He intends to reinvigorate that culture, returning to the "tick-tock" cadence of product deliveries, starting in 2022. He also announced that the Intel Developer Forum (IDF), retired in 2016, will return as the "Intel ON" technical conference later this year.

Clear communications will be essential to Intel's manufacturing strategy, as it builds up the new Intel Foundry Services business. It's important to avoid confusion about priorities and roadmaps – whether for Intel's core products or for its foundry capabilities. Critical to the success of this strategy for expanding Intel's roles – as producer, manufacturer, and foundry partner – will be clarity regarding Intel's mission, and its support for a wider customer base worldwide.
