**Operator**

Good day, ladies and gentlemen, and welcome to the First Quarter 2019 Intel Corporation Earnings Conference Call. [Operator Instructions]. As a reminder, today's program is being recorded. And now I'd like to introduce your host for today's program, Mr. Mark Henninger, Head of Investor Relations. Please go ahead, sir.

**Mark Henninger**

Thank you, operator, and welcome, everyone, to Intel's First Quarter 2019 Earnings Conference Call. By now, you should have received a copy of our earnings release and the earnings presentation. If you've not received both documents, they're available on our Investor website, intc.com. The earnings presentation is also available in the webcast window for those joining us online.

I'm joined today by Bob Swan, our interim CEO and Chief Financial Officer; Murthy Renduchintala, Group President of the Technology, Systems Architecture and Client Group and Chief Engineering Officer; as well as Navin Shenoy, Executive Vice President and General Manager of the Data Center Group. In a moment, we'll hear brief remarks from Bob followed by Q&A. [Technical Difficulty]. We're having technical difficulties. Let me jump back in here. I'm joined today by our CEO, Bob Swan; our CFO, George Davis; and in a moment, we'll hear brief remarks from both of them, followed by the Q&A.

Before we begin, let me remind everyone that today's discussion contains forward-looking statements based on the environment as we currently see it and as such, does include risks and uncertainties. Please refer to our press release for more information on the specific risk factors that could cause actual results to differ materially.

A brief reminder that this quarter, we have provided GAAP and non-GAAP financial measures. Today, we will be speaking to the non-GAAP financial measures when we describe our consolidated results. The earnings presentation and earnings release available on intc.com include the full GAAP and non-GAAP reconciliations.

With that, let me hand it over to Bob.

**Robert Swan**

Thanks, Mark. With the interim introduction, I thought on our outlook I was getting demoted already. But look, coming off a record 2018, our top line results came in slightly higher than expectations, with upsides in the PC and

IoT segments, offset by incremental NAND pricing weakness. Total revenue of $16.1 billion was flat year-over-year, as our PC-centric business grew 4% and our data-centric businesses were down 5%. The team executed well, though underlying trends are concerning, and as a result, we've revised our expectations down for the full year.

I'll give you some insight into the customer trends informing our outlook, but first, I'd like to take a few minutes to recap the progress we've made over the first quarter. It's been just under 3 months since I was honored with the best job in the world. At that time, I said that our leadership team would focus relentlessly on delivering for our customers to take advantage of the biggest opportunity in our company's history. We're making important progress by intensifying our focus in 3 key areas: expanding our TAM, accelerating innovation and improving our execution while evolving our culture. I'd like to spend a few minutes talking about our philosophy and progress in each of those areas.

First, expanding our TAM. We are transforming from a PC-centric company to a data-centric company, and our ambitions are bigger than they've ever been. Our aim is to identify and capitalize on key technology inflections that set us up to play a larger role in our customers' success while improving returns for our owners. You can see the impact of this approach in our Q1 execution.

For example, our first-ever data-centric portfolio launch marked an important milestone in our efforts to capitalize on the AI opportunity and undisputed technology inflection. Our new second-generation Xeon Scalable is the only processor in the industry with built-in artificial intelligence acceleration. Not only did we deliver a 14x generation-over-generation performance improvement, but we also showed CPU performance beating GPU performance on major AI workloads like recommendation engines. And we worked closely with the software industry ahead of the launch to deliver a great out-of-the-box experience for customers like Siemens. They're collaborating with us on a breakthrough AI-based cardiac MRI model. This application has the potential to provide real-time diagnosis using the DL Boost technology in our newest Xeon Scalable processor.

Another TAM-expanding business that continues to gain traction is Mobileye, with 8 new global ADAS designs in the first quarter alone, including our first win in India. Mobileye's real-time crowd-sourced mapping technology, Road Experience Management or REM, continues to build momentum with a major North American automaker adopting this breakthrough data-centric capability. Autonomous driving is a technology inflection that we're ready to lead.

2019 will be a foundational year for another disruptive technology, 5G. As you know, we recently sharpened our 5G focus. When it became apparent that we don't have a clear path to profitability in 5G smartphone modems, we acted. We are now winding down that business and conducting a strategic assessment of 5G modems for the PC and IoT sectors while continuing to meet our current 4G customer commitments. By acting now, we focus our 5G efforts on the transformation of the wireless network and edge infrastructure, where we have a clear technology advantage, market share to win and a strategic role to play with customers.

At Mobile World Congress, we demonstrated a range of 5G products under development, including the 5G-ready N3000 FPGA acceleration card and the new 10-nanometer-based Snow Ridge network SoC for use in 5G base stations. As networks cloudify, Intel is in a great position to win in this base station segment, where we expect to grow to 40% market segment share by 2022. The vast majority of the 5G market opportunity and profit is in the transformation of network and edge infrastructure, where we are now laser focused.

Next, accelerating innovation. Successfully competing in a bigger TAM requires a broad range of products and technologies. Only Intel has the breadth of IP to deliver leadership products across increasingly diverse workloads for the data-centric era. Harnessing data for discovery, invention and business value is not a one-size-fits-all computing challenge. That's why we are investing in 6 important pillars of innovation: process technology, architecture, memory, interconnect, security features and software. Already this year, we've introduced incredible examples of this approach to innovation across the business. Let me take a minute to talk about a few.

We are currently architecting what we expect will be the United States' first exascale supercomputer for the U.S. Department of Energy's Argonne National Laboratory. This supercomputer, called Aurora, will be delivered in 2021 and powered by Intel technologies designed specifically for the convergence of artificial intelligence and high-performance computing. These include a future generation of the Intel Xeon Scalable processor, Intel's Xe compute architecture, a future generation of Optane persistent memory and Intel's One API software. It's a great example of how our data-centric products architected together can deliver technology breakthroughs for our customers.

We are also accelerating innovation in our PC-centric business. For example, our team is hard at work with our OEM customers to define and deliver a stunning new class of next-generation laptops. We call this Project Athena, and the first of these sleek, beautiful designs are coming in the second half of 2019. And just this week, we launched the most powerful generation of

Intel Core mobile processors ever, designed for gamers and content creators.

On the process technology front, our teams executed well in Q1 and our velocity is increasing. We remain on track to have volume client systems on shelves for the holiday selling season. And over the past 4 months, the organization drove a nearly 2x improvement in the rate at which 10-nanometer products moved through our factories.

Finally, execution and culture. This is about concentrating our resources on the vital few programs that will have an impact on our customers' success and our owners' return, rather than the trivial many. Over the last couple of years, that focus has resulted in exiting McAfee and wearables business, shutting down Saffron and divesting Wind River. And our spending as a percentage of revenue has gone from approximately 36% to about 30% this quarter. It has allowed us to invest more of our resources, and just as importantly, our collective attention and focus, where it really counts. By doing fewer things, we'll execute better at the things that matter most.

Specific areas where we need to improve execution include meeting customer demand and delivering on our 10-nanometer lineup of products, and we are making progress. Our supply constraints have had a disruptive impact on our customers and ecosystem. We've committed never again to be a constraint on our customers' growth. We've increased capacity to improve our position in the second half, although product mix will continue to be a challenge in the third quarter as our teams align available supply with customer demand.

As I shared earlier, our confidence in 10-nanometer is also improving. In addition to the manufacturing velocity improvement I described earlier, we expect to qualify our first volume 10-nanometer product, Icelake, this quarter and are increasing our 10-nanometer volume goals for the year.

I'll shift now to our full year outlook. Going forward, George will deliver our forecast. But given this is his third week with us, I'll share my thoughts on our full year reset and he'll review our first quarter results and second quarter guide.

Our conversations with customers and partners across our PC and data-centric businesses over the past couple of months have made several trends clear. The decline in memory pricing has intensified. The data center inventory and capacity digestion that we described in January is more pronounced than we expected, and China headwinds have increased, leading to a more cautious IT spending environment. And yet those same customer conversations reinforce our confidence that demand will improve in the

second half. So we've reassessed our '19 expectations based on the challenges we're seeing.

Our full year outlook is now $69 billion in revenue, down 3% year-over-year and down approximately $2.5 billion from our previous estimate. Given the magnitude of change, we'll be somewhat more granular in explaining the drivers. We now see data-centric revenue down low single digits year-over-year, with DCG down mid-single digits year-over-year off a tough compare, continued China weakness and inventory and capacity absorption. We are also anticipating an incrementally more challenging NAND pricing environment.

Our PC-centric forecast remains unchanged at low single digits. We are forecasting operating margin to be 32%, down approximately 3 points year-over-year and down approximately 2 points from our previous guide. This outlook reflects lower full year revenue and a year-over-year decline in gross margins as a result of the 10-nanometer ramp and NAND pricing.

We continue to see good discipline on spending and expect our exit from the 5G smartphone modem segment, annualized in 2018 spending actions, and incremental spending efficiencies to reduce OpEx by approximately $1 billion year-over-year, partially offsetting the impact of lower gross margin. We now forecast full year EPS at $4.35 per share, down approximately 5% year-over-year and $0.25 from our previous guide. We now expect our full year tax rate to be 12%, up 1 point year-over-year and down 1.5 points versus our prior guide, largely as a result of lower pretax income.

Before I hand the call over to George, I'd like to welcome him as Intel's new CFO. I've known George for a long time from his CFO days at Applied Materials while I was a board member. He brings deep industry knowledge from prior roles. He's a true team player and he cares deeply about people development and diversity. George will review our first quarter financials and second quarter guide, then we'll get to your questions. George?

**George Davis**

Thanks, Bob, and good afternoon, everyone. I'm delighted to be at Intel and look forward to regularly engaging with our key stakeholders. Revenue for our first quarter came in at $16.1 billion, flat year-on-year and slightly higher than our guide. Data-centric revenue was $7.5 billion, down 5%; and PC-centric revenue was $8.6 billion, up 4% year-on-year. Q1 operating margin was 28%, down 2 points due to cost of our 10-nanometer ramp and NAND reserves, partially offset by platform ASP strength as supply constraints at the low end in CCG led to an especially rich mix as well as lower spending overall.

Q1 EPS came in at $0.89, up 2% versus the prior year and $0.02 over what we guided for the quarter. Year-to-date, we have generated $1.6 billion of free cash flow; returned $3.9 billion to shareholders, including dividends of $1.4 billion; and repurchased approximately 49 million shares.

We are pleased with the team's focused execution for the quarter. We anticipated a challenging start to 2019, and that's what we have encountered. We also knew that the timing of our 10-nanometer ramp would pressure margins in the first quarter. And while we continue to make progress on the road map, that pressure remains a factor.

We see customers becoming more cautious in their buying patterns, with the most acute deceleration happening in China. Demand pressure is particularly evident in our data center business, where we are seeing a continuing inventory correction in enterprise and comms and capacity digestion among cloud service providers who ramped consumption strongly in 2018.

Non-GAAP EPS was up 2% year-over-year driven by strength in our client and IoT ASPs, lower spending, lower shares outstanding and the McAfee dividend received in the quarter. Offsetting factors were continued NAND pricing pressure, 10-nanometer ramp cost and weak enterprise and government data center demand. Our tax rate came in at 12.5%, up almost 1 point year-over-year due to nonrecurring benefits in Q1 of 2018.

We continue to improve our operating efficiency year-over-year from 32.4% to 30.3% spending as a percent of revenue. Total spending was down 7% year-over-year in the quarter as we drove efficiencies in our SG&A spending and kept R&D spending flat compared to the prior year. Within that overall flat R&D spend, we are making thoughtful trade-offs so that we can amplify the investments into key priorities to grow the business. This has resulted in more investment in 10-nanometer and 7-nanometer process technology and accelerating road maps in DCG and CCG and in key growth areas like autonomous driving, AI and 5G network infrastructure.

Let me now break down our performance by segment. Our Data Center Group ended the quarter with revenue of $4.9 billion, down 6% from the prior year and 19% sequentially within our expected range of sequential decline, given the headwinds we noted last quarter. Against the challenging year-over-year compare, platform units were down 8%. We saw record Xeon ASPs as customers continue to select high-performance products. We also saw a strong ramp of network SoCs, resulting in moderation of our blended platform ASP.

Non-CPU adjacencies were up 2% driven by strength in network ASICs and silicon photonics. Cloud revenue grew 5% year-over-year in the first quarter

as cloud service providers absorbed capacity put in place in 2018. Enterprise and government revenue declined by 21%, and comms service provider revenue declined 4% year-over-year in the first quarter as both enterprise and comms customers worked through inventory and China demand weakened.

Overall, our data-centric businesses were flat year-over-year. Our IoT businesses saw 19% revenue growth adjusted for Wind River and operating income growth of 11% year-on-year due to a mix shift to higher core products in the quarter, with the growth of compute-intensive applications like AI and computer vision.

Mobileye had record revenue, up 38% due to an extended -- expanded product portfolio and customer base. Our memory business was down 12% due to continued NAND pricing pressures, offset by NAND data center and client bit growth. Operating income for this group is down driven by NAND ASP deterioration and demand softness, resulting in inventory revaluations.

The PSG group declined 2% year-on-year due to weakness in cloud and enterprise, partially offset by strength in wireless and advanced node products. The Client Computing Group showed continued growth, with revenue up 4% year-over-year. Platform revenue was up 3% driven by strength in large commercial and gaming. Modem drove the majority of strength in the adjacencies, resulting in a 26% increase over the prior year. We have added supply capacity and continue working closely with our customers to align our available supply to their demand. However, supply of our PC processors and chipsets remains tight, particularly for our small core products as we prioritize big core. We saw strong ASP growth in desktop and notebook in part due to the small core constraints, but also on strong performance in gaming. Constraints were also responsible for the year-over-year decline in volume.

This quarter, we generated $5 billion in operating cash flow, and we invested $3.3 billion to expand our 14-nanometer capacity and ramp 10-nanometer. We raised the dividend by 5% and repurchased 49 million shares.

Let me wrap up with our Q2 outlook. We expect Q2 revenue to be $15.6 billion, down 8% year-over-year. Our data-centric businesses are expected to decline in the high single digits year-over-year as memory pricing declines weigh on our NAND business and DCG customers continue to consume inventory and absorb capacity. We expect DCG to be approximately flat sequentially. The PC-centric segment is expected to decline in the high single digits on declining PC ASPs on a relative mix of more small core units. Operating margin in Q2 is expected to be 29%, down 4 points year-over-year on lower platform revenue, the 4G modem ramp and NAND pricing.

We forecast earnings per share of $0.89, flat sequentially and down $0.15 year-over-year. We expect the non-GAAP tax rate in the quarter to be 11.5%.

I will conclude here and turn the call back to Mark.

**Mark Henninger**

Great. Thank you, George. After that eventful start to the call, we'll now move on to the Q&A. [Operator Instructions]. Operator, please go ahead and introduce our first caller.

**Question-and-Answer Session**

**Operator**

Certainly. Our first question comes from the line of Joe Moore from Morgan Stanley. Our next question comes from the line of Aaron Rakers.

**Aaron Rakers**

Yes, as we think about the gross margin trajectory through the course of the year, I'm wondering if you could help us understand the delta between the impact of 10-nanometer ramping relative to kind of the impact that you're seeing. It seems like it's going to persist, related to NAND flash.

**Robert Swan**

Yes, it's lots of movement going on in the gross margin line. I'd start by saying implied in our guide for the first half is roughly 60%, so it implies a little increase off of Q1. And our implied guide then for full year is almost 60%. So through all the ups and downs, there's going to be quite a bit of consistency. That being said, the Q1 will likely be the lowest, because as I indicated in my prepared remarks, that we're going to -- we intend to qualify the 10-nanometer part in the second quarter. So what that means is in the first quarter, all of our 10-nanometer cost is flowing through cost of sales. When we qualify, it goes on the balance sheet. And then when we sell those previously reserved units in the third quarter, those units go out with no cost. So the dynamics imply low Q1 and a much stronger Q3, but through it all, fairly stable at roughly 60% level.

On the year-on-year decline, obviously, the NSD -- sorry, NSG pricing is having a real impact on us. We expect NSG for the year to be down roughly 10% almost, and that is primarily driven by significant change in pricing dynamics during the course of the year. So that'll be a headwind for us throughout the year.

Aaron, sorry, I should probably add something, Mark. The one last thing is, as we indicated, we expect to have systems on shelf in the fourth quarter or for holiday season, so -- and that given the progress we've made on 10, we're going to be shifting more units in the fourth quarter than we previously anticipated. So all else equal, that implies Q4 would a little bit lower than the full year guide.

**Operator**

Once again, Joe Moore, your line is open.

**Joseph Moore**

With regards to DCG being down mid-single digits for the year, I understand the issues in the first half. But it seems like the cloud guys were -- the CapEx has been okay, and I thought we had a little bit more snap back in the back half. Can you just talk a little bit more about the dynamics, specifically on the cloud side, and related to your -- the inventory that they may have of your parts there?

**Robert Swan**

Yes. Joe, as you know, the -- we came off a very strong 2018, up 21%. As we came into the year, implied in our guide, particularly in Q1, was our expectations that we'd be in quite a digestion period, both for enterprise and government but cloud as well and that, that would really impact our Q1. Look, what we're highlighting today as it relates to cloud is two things: that we expect the digestion to continue into Q2; that demand is going to be soft in Q2. And it's even exacerbated in China where, if you'll remember, through the third quarter last year, our demand for cloud players in China was close to triple digits. That was negative in the first quarter. So overall, they're still in a digestion period, the cloud guys. And in China is even -- it's been even more dramatic in the first quarter and the first couple weeks here in the second quarter.

That being said, when we asked that, when we look at end demand in this data-centric environment, when we're looking at end demand, it still seems relatively strong. And the -- in our dialogues with our customers, they are implying an uptick as we move from first half into second half.

**Operator**

Our next question comes from the line of Toshiya Hari from Goldman Sachs.

**Toshiya Hari**

I had a question on your enterprise business within DCG. I was a little bit surprised by the magnitude of the decline in Q1. Bob, in your view and based on what you know, what you hear from customers, how much of that decline is tied to true end demand versus inventory dynamics at your customers? And I ask that question because some of your customers may have pre-bought in fear of supply constraints.

**Robert Swan**

Yes, it's a great question. Truly, we believe that there's the end demand, and forget about which segment, but end demand remains relatively strong. But by segment, enterprise and government year-on-year decline was not way off what we expected, because we didn't have a real robust guide for Q1, but we have seen it continue into the second quarter. And I just think that the ordering ahead or the digestion of last year's strong growth, we expect now just to continue in enterprise and government through the first half and even a little more into the second half as it relates to E&G.

**Operator**

Our next question comes from the line of Stacy Rasgon from Bernstein Research.

**Stacy Rasgon**

I wanted to know, of the mid-single-digit decline for data center, how much of that do you think is units versus pricing? I would have expected, with the new platform launch, we might have seen better. And obviously, you have the inventory in digestion, but there's also competition that's coming in the second half. So how do you see units versus pricing declining within the envelope of your down mid-single digits for the business overall?

**Robert Swan**

Yes, we kind of -- as we came in -- the updated guide, the guide now is more a unit story. When we came into the year, back in January, our expectation on ASPs is they would be pressured in DCG by 2 things in particular: one, just we indicated at the time that we expected an increased competitive environment as we go into the second half; and then two, as we look at 5G SoCs beginning to ramp as we go into the fourth quarter, they tend to be at lower ASPs. So we expect product enhancements, but offset by tougher competitive environment and mix of SoCs for the comms service providers. So the big change from January is really more a unit story. And we think we bounded the ASPs best we could back in January time frame. That hasn't changed.

**Operator**

Our next question comes from the line of C.J. Muse from Evercore.

**Christopher Muse**

I guess a question on the modem side of things. As you think about the cost savings as you deemphasize that business, will that be repurposed? Or should that accrue to the bottom line? And can you give some thoughts as to what the cost savings will have -- look like and what time frame we should see it?

**Robert Swan**

Yes, let me -- C.J., let me take a run and ask George to chime in as well. We announced that we were going to exit the 5G smartphone business and that we are going to evaluate the 5G Modem in other applications, like PC and IoT, while assessing our alternatives as it relates to the 5G Modem overall. So what's reflected in kind of the updated guide we gave is we do expect lower spending for 5G smartphone as we go through the course of the year. That is part of the lower spending going into the second half that we reflected. But we also -- we haven't really completed our assessment about what to do with the wonderful IP that we've developed, the real strong team that we have and the other opportunities we have, whether it's in network infrastructure, where we're really excited about the role we'll play in 5G, or whether it's the role that 5G Modem plays in these non-smartphone applications. So that's something that we're working very hard on to try to get to the right answer about how we'll deal with the technologies we built, the capabilities we have and what the implications will be on cost structure as we go into the second half of the year and into next year. So that's still a work in progress.

**George Davis**

And C.J., I just might add, we talk about spending being down $1 billion year-over-year, I would say the expectations for slowing 5G spend or reducing 5G smartphone spend prior to getting through the decision process of -- that we're going through right now, is maybe 20% to 30% of that. So there is not a lot yet evident in the spend rate that we're talking about that results from the 5G Modem business.

**Operator**

Our next question comes from the line of John Pitzer from Crédit Suisse.

**John Pitzer**

I know you would like us to focus a little bit more on op margin than gross margin, but I just want to go back to the gross margin line. As far as I can remember, with an in line revenue quarter for March, this is the most significant gross margin miss to Street estimates that I can remember for the company. And I know you've talked about 10-nanometer volumes being higher than you expected this year. Can you talk a little bit about the yield curve and kind of the cost of 10-nanometer? And I guess really importantly, if the long-term sort of upper range of your gross margin had been 60% to 65%, do you still think that that's the right sort of higher-end range as we go to the 10-nanometer node for CPUs, notwithstanding that some of the adjacencies are lower gross margin?

**Robert Swan**

Yes. Thanks, John. First, in the first quarter, kind of 2 things that really impacted gross margin: one, frankly, we planned for and played out as we expected; and two, we did not plan for. But the one we planned for is just as we ramp 10, and as you're aware and I mentioned earlier, until we qualify the product, which we expect to do in the second quarter, all that cost flows through cost of sales. So when we're in early stages of ramp prior to qualification, that does compress gross margin. And that played out as we expected, because I mentioned in my prepared remarks that our progress and our improvement on 10-nanometer yields was in line with what we've expected coming into the year, a little bit better, that gave us the comfort that we're going to increase volume at the end of the year. But Q1 is just the dynamics of all of that ramp cost going through cost of sales. That was planned and that was anticipated. The not planned in the quarter was just the ASP declined much greater than we had anticipated for NSG. We were in the -- we were expecting kind of mid-20s to 30% ASP declines. The reality is it was closer to the mid-40s. And as a result, and George flagged this, but as a result, we had to take a lower cost or market reserve against our inventory balance in the quarter. That cost us over 1 point of gross margins in the quarter. That we did not quite anticipate.

So gross margin Q1, in line with kind of what we thought, with the exception of inventory reserves that we took in the quarter. And as I said, Q2, we expect it to be better than Q1 because we'll begin to capitalize those costs because of the progress we're making on 10-nanometer. And then just to kind of go from your Q1 to your 5 years out point of view, I guess maybe on the gross margin, operating margin dynamics, maybe we'll defer that, kick the can couple of weeks, until we see you on May 8 when we kind of walk through our longer-range planning process.

**Operator**

Our next question comes from the line of Timothy Arcuri from UBS.

**Timothy Arcuri**

Bob, I wanted to ask you just a question strategically about memory. And I wanted to understand, obviously, you need to make cost point, but relative to NAND, why the need to make NAND on your own? It seems like you could sell the factory and maybe strike some sort of a supply agreement and save a lot of free cash flow, particularly after a quarter rotation can cost you 100 basis points.

**Robert Swan**

Yes. First, maybe just some context on when we talk about expanded TAM, the -- maybe the criteria we think about and then I'll try to apply them to where we are in memory. First, we look for technology inflections where we think we have a real advantage, whether it's process manufacturing or performance-oriented design that is worth pursuing, number one; number two, such that we can play a more important role in the success of our customers; and third, in an area where we think we can get attractive returns for our investors. So those are our -- the 3 criteria that we're applying, and we're going to be increasingly disciplined on the third aspect of those criteria.

As it relates to memory, we have a high-performance Optane product that we think is really differentiated, coupled with our CPU that can do things best in industry that's really needed to keep pace with the increased performance of CPU processing. So strategically, we think it's really important. Technically, we think we have a real advantage. And third, we think we can get good returns.

As it relates to NAND, we think we have process technology advantage. We're in the stage where we've gone from 32-layer to 64-layer now. The profitability of the NAND business pre this massive decline in ASPs was okay last year as we were ramping the business. And our challenge going forward is we're just going to have to execute better on the NAND business, so we can check that third box of attractive returns for our investors. And I don't want to -- when the market's plummeting I don't want to conclude what the right decision is. I want to maybe look through the horizon a little bit to get to the right decision. But clearly, we got to generate more attractive returns on the NAND side of the business, and the team is very focused on making that a reality. And to the extent there is a partnership out there that's going to increase the likelihood and/or accelerate the pace, we're going to evaluate those partnerships along the way so it can be enhancing to the returns of what we do in the memory space.

**Operator**

Our next question comes from the line of David Wong from Nomura.

**David Wong**

Bob, given your stance on concentration of resources, what are you thinking with regard to Intel developing a term GPU product? And if you are pressing ahead with this, can give us an update on where you are and when we might see the first Intel GPUs?

**Robert Swan**

Yes. I mean first, as we think about the key technologies that we believe are going to be increasingly important going forward, I flagged them earlier, but we characterize them as our -- kind of our 6 pillars of technology differentiation. Obviously, process technology is an important component; Second, architectures, I'll come back to that; third, memory; fourth, interconnect; fifth, security; and sixth, software. And how we bring the collection of those 6 things together that nobody else in the industry can do, we think is really what's going to allow us to capitalize on an increasingly data-centric world.

When we think about architecture, we just -- as we learn more and more about how workloads are evolving and the increasingly importance of artificial intelligence and parallel processing, we believe that architectures beyond the CPU, like GPU, like FPGA, like AI, like other accelerators, become increasingly important. So we have decided that we are going to invest in discrete GPUs. We're going to launch a new integrated GPU in the near term, which we're pretty excited about. But discrete GPUs, I think we said that we are going to launch it in 2020 time frame, both for clients and for data center. Increased workloads, we're going to leverage the integrated technology that we've enhanced and invested in discrete GPUs because we think it's an architecture that's increasingly important. And we think we can develop some real attractive products based on our existing core architecture.

**Operator**

Our next question comes from the line of Vivek Arya from Bank of America.

**Vivek Arya**

Bob, I had a question on 10-nanometer progress and the competition on the server side. I know your -- the team is sounding more confident about 10-nanometer on the client side. I'm curious what the progress is on 10-

nanometer and the server side, and as part of that, how do you think your customers are reacting to a competitor bringing out their products in the back half? Your products are coming out next year. What are you hearing from customers as to how they are thinking about the next generation of server CPUs and the desire for perhaps diversifying suppliers?

**Robert Swan**

First, on 10-nanometer for server, what we've indicated is that we would have client systems on shelf for the holiday season, and our expectation is that server CPUs would be a fast follow. Historically, I think it's been more of a 12- to 18-month gap between client and then server. On 10-nanometer, that gap would be much shorter. And again, what we said is fast follow after client systems on shelf, so sometime in 2020, earlier versus later. In terms of just competitive positioning, with the -- we've been -- our Xeon Scalable product that we launched last year and then enhanced with our Cascade Lake launch just a few weeks ago I think, that has increased performance. It's got AI acceleration built into it. It's coupled with Optane memory. It's got a 56 core count. And the performance of that product, coupled with our knowledge of the environment in which -- our customers' environments, we think we really have demonstrated differentiated performance, a product leadership performance, even though it is still on 14-nanometer.

So we have a good product that really pulls together those 6 pillars that I talked about earlier. We launched it a few weeks ago. We said we expect it to ramp as fast as any launch that we've done in the past. And we think it positions us competitively in the second half of the year, despite increased competition prior to launching 10-nanometer in 2020.

So we feel good about 10-nanometer in general. We're going to be a fast follow with server in 2020. In the meantime, the Cascade Lake product has some real performance enhancements based on our deep domain knowledge of our customers. And it'll be an increased competitive environment, but we feel pretty good and we tried the best we could to capture that in our outlook for 2019.

**Operator**

Our next question comes from the line of Harlan Sur from JPMorgan.

**Harlan Sur**

5G network connectivity is very strong and projected to continue to accelerate on a go-forward basis. Korea, China, U.S., all starting to fire. You guys have a great lineup of products, Xeon D, full-blown Xeon, base station ASICs, FPGAs and so on. So help us understand, given all these dynamics,

why did the comms service provider segment decline year-over-year in Q1? And maybe more importantly, just given the strong 5G lineup that you have, do you see comms service provider contributing to the strong second half implied growth in your data-centric segment guidance for the full year?

**Robert Swan**

Yes. I think, first, yes, we feel like we got a great product lineup for the launch of 5G. We have a strong position today, and we think 5G is only going to accelerate that across a broad swath of our products and technologies. The -- a couple of things going on, we believe, in Q1. One, just in terms of the increased demand, we do expect it to be coming maybe a little bit later in the year. I think FPGA is a little bit earlier, but the Xeon, we expect to follow later in the year and even more in 2020, to be honest with you. So timing, we expect it to be out a little bit, modest improvement in the second half but not dramatic.

And the other thing I would say is that we have a strong customer base in China in comms. And we -- like we saw in cloud and enterprise and government, comms growth we think was also impacted by strong comms growth last year that's probably being digested a little bit in the first couple of quarters of this year. Again, one of our large customers in China is a contributor to the question earlier about buying ahead and then digestion, is a weight on comms growth in the first quarter. So we're pretty excited about the demand signals we're seeing, the relationships we've built for 5G and think it's going to be a really important part of our story going forward.

**Operator**

Our next question comes from the line of Ambrish Srivastava from BMO.

**Ambrish Srivastava**

Bob, I just wanted to -- I was wondering if you could shed more light on the DCG op margin. We've not seen this low a number in quite a few quarters, I think 6 to 8 quarters, 38%. And you list 3 reasons, but it disproportionately seems to be lower versus the revenue decline. Could you shed a little bit more light? And more importantly, how should we expect this to trend as the year progresses?

**Robert Swan**

Yes, I mean I think the things we flagged, obviously, unit volume declines on a high-margin business worked against us. Secondly, it's really DCG now. I talked to you about the fast follow of DCG on 10-nanometer after client launch. So as a result, they're just now beginning to bear some of the brunt

of the cost of sales that all went through the P&L in the first quarter until those products qualify. And then third, this is a -- this is a big growth area for us and we're going to continue to make investments. So those 3 things are really what drove the op margin decline in the quarter.

As you know, just from historical trends, data center margins tend to be a little bit lower in the first quarter. And obviously, implied in our guide first half to second half, second half is a little stronger. And with that strength on unit volumes despite maybe more intense ASP environment, we expect operating margins to kind of improve in line with revenue growth in the second half. Those trends are fairly consistent with how the quarterly dynamics of DCG operating margins go. They're just more exacerbated in Q1 with the 10-nanometer cost of sales starting to impact the business.

**Operator**

Our final question for tonight comes from the line of Blayne Curtis from Barclays.

**Blayne Curtis**

Just one more on gross margin, if possible, and I know you don't want to comment on '20. But I'm just trying to understand the trajectory here, because it seems like your 10-nanometer has been delayed. You're ramping it now. It does seem like it's on a portion of the product line, not like the old days, where it would flip over all of client. So I'm just trying to understand, if you look at the impact you saw this year, why is it incorrect to think about that you should see a similar impact next year?

**Robert Swan**

Well, yes, I think you know that our expectations are as we begin to ramp high-volume manufacturing, that in conjunction with that, we expect to see improved yields and better units-to-die performance as we go throughout the course of the year and as we step on the pedal and ramping volumes. So the -- part of the answer is we expect to improve yields as we go forward. But that being said, any time we transition to a new node, the earlier stages tend to be -- have a little bit of a compression effect on gross margins until we get a little more maturity. And I don't want to get out ahead on 2020. We're more focused on '19 right now, but it's natural for the transition to a new node in early stages to have a bit of a downward pressure on gross margin.