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EDITED TRANSCRIPT

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REFINITIV

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PRESENTATION

Operator

Welcome to the 2022 Analog Devices Investor Day event. And now, ADI's Vice President, Investor Relations and FP&A, Michael Lucarelli.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

Thank you. Good morning, everybody. Thank you for joining us on our new headquarters in Wilmington, and thank you to those online partaking in the day as well. I'm Michael Lucarelli, Head of Investor Relations and FP&A here at ADI. We have a very exciting day planned ahead and a packed agenda. But first, as you know, I get to do the housekeeping.

I'm not going to read through everything on the slide, but I encourage everyone in the room and online to do so. We will make forward-looking statements today, and these are based on the view of the world today.

Our actual results may differ from these forward-looking statements. We take no obligation to update these statements. For risks and uncertainties that may cause our view to change, please see our reports filed with the SEC, our 10-K and our investor website.

We will also be referencing non-GAAP metrics. For reconciliations to the GAAP metrics, please see the appendix to the presentation that will be posted today.

Now let's talk about the agenda. Like I said, it's packed and it's great. Our CEO, Vince, will kick off. He will share his vision for the next decade for this company and also talk about our franchise that's been built over 50 years and really supercharged over the past 10 with acquisitions, R&D and a strategy that's unmatched in the industry. And like I said, he'll we'll talk about the next 10 years where we're going.

Then we have 5 business leaders: Karim, Jen, Pat, Greg and Patrick to really dive deep into their businesses and talk to you about what and amplify the growth and what we're excited about within those businesses. This will be followed by a Q&A session outside in the hub area, and then we'll move back in here for the second part of the day -- or second part of the presentations.

Here, we have 3 more presentations, Anelise, our Chief Customer Officer, who will discuss the view of future growth and also talk more about revenue synergies with Maxim. Then Vivek Jain, Head of Manufacturing, will discuss our unique and strategic hybrid manufacturing model and why it makes sense for us at ADI. And we'll end the presentation with Prashanth and he will outline our new long-term model, which I know everyone is anxious to see and hear about.

I will say, for those here in person, probably the most exciting part of the day comes after that. We have customer-led demos in the afternoon after lunch where you actually see our technology in action in the end applications. We have robotic demos from J&J, Rockwell, SICK sensors. We actually have a 5G radar unit from Samsung. And we also have a Cadillac LYRIQ, which uses our wireless BMS technology. And we also have Keysight and Teradyne showing off testers that we're big piece of.

And with that, I'm done talking. Let's go to the video and start the day. Thank you.

(presentation)

Operator

Please welcome ADI's Chief Executive Officer, Vincent Roche.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

A very, very good morning to you all. You're very welcome to our first Investor Day in almost 5 years. We're really delighted to have you here.

Well, as Mike said, we've got a very busy day ahead of us with many of our business and operations leads here to share updates on the trends that are driving our business and how we're positioned to capitalize on the trends to produce extraordinary growth.

So what I'd like to do is start off by covering first, how we've built ADI into the premier analog franchise over the last 57 years and how we're ever evolving to continue to withstand the test of time. Second, the growth opportunity we've got ahead of us because of our continued innovation, deep customer relationships and tailwinds in key growth markets. And third, how we're executing on our long-term vision to build and power the intelligent edge between the physical and cyber by bridging digital technologies and software, bringing it to the edge to make it more intelligent and prescient.

Now at our essence, ADI exists to solve our customers' most important problems because that's how we create maximum value. And we possess many unique strengths. Over the last 6 decades, we've built the highest performance analog portfolio and earned market leadership across areas

like RF, power and signal chain. We benefit from incredible diversity across our customers, our markets and applications, which serves us well not only in downturns, but also in periods of growth. And importantly, at our core, we're a global team of problem solvers.

Our engineering culture is defined by working closely with our customers to do things that nobody else has done, and our talent is truly a competitive advantage. Our hybrid manufacturing model is another key differentiator, providing resiliency and optionality, and Vivek will share more on this in just a while. And also, our hybrid go-to-market model is evolving to enable a personalized but scalable customer engagement, which Anelise will cover in some detail later. And finally, our solutions command and innovation premium, and this has helped us to deliver a track record of industry-leading financial performance over the years.

Now ADI's technologies transform physical phenomena into digital intelligence and actions that ignite human breakthroughs. Our commitment to innovation has enabled us to stay ahead of what's possible and we've remained at the forefront of each wave in the evolution of the ICT sector over our history.

Now over the past 60 years, the sector has experienced 3 major shifts: the mainframe era, the personal computing and mobile era and the Internet of Things era. The current wave is characterized by ubiquitous sensing, hyperscale computing and pervasive connectivity. The next wave is the nascent digital edge revolution. It will be driven by a deluge of data, AI and machine learning, with intelligence moving closer to the physical edge.

And these trends are driving new generations of intelligent edge applications across, for example, autonomous driving, advanced communications, digital health care, Industry 4.0 and augmented and virtual reality. And this means more points of linkage between the physical and the digital, which will drive even more demand for analog semiconductors. And ADI is really well positioned, through our investments and customer relationships, to capitalize on these secular growth vectors to lead the intelligent edge advance.

Now fundamentally, we're an innovation-driven enterprise with a commitment to R&D investment to strengthen our core franchise and capture the market opportunities presented by secular growth drivers. Over the last decade, our organic investments have been bolstered by our acquisitions of Hittite, LTC and Maxim, which has created the premier analog franchise, spanning microwave to bits, nanowatts to kilowatts and sensor to cloud.

The diversity of our portfolio is powerful with approximately 75,000 product SKUs, and 80% of our revenue is derived from products that individually contribute no more than 0.10% of total revenue. And the longevity of our products is unmatched. On average, our products have lifespans of 10 years or more and in some cases, much, much longer than that, delivering effectively recurring revenue streams for decades.

Our portfolio diversity and longevity reflect on our commitment to continuous innovation and taking a long-term view to our 125,000 customers, both big and small. And it's these characteristics that create a high barrier to entry and the business model is both resilient and rich with growth opportunities.

Now we have great confidence in our future because of our strong market and technology position and the market growth drivers that we're seeing today, which has enabled us to build the largest revenue opportunity pipeline in our history. And I'm excited today to share a significant change to our revenue growth targets. We're increasing from mid-single digits to 7% to 10%. And over the remainder of my presentation and the other presentations and demonstrations you'll see today, we'll share a few of the high-growth opportunities that will build upon our solid franchise to deliver on this new growth model.

The long-term trends in how our customers are engaging with us is one source of our confidence in bending the growth curve. We're not a transactional vendor. We have become a trusted innovation and supply chain partner to our customers. The growing scope of our customers' products is dramatically expanding in complexity and pressuring product development times. Consequently, customers are turning to ADI to help them to tame these growing complexities, leveraging and relying on ADI's deep domain expertise and unparalleled signal processing and power solutions. This frees them to focus on adding their unique areas of differentiation to their products.

Importantly, this isn't a short-term business cycle phenomenon. In my conversations with customers, one of their primary asks is that we build longer-term strategic collaborations with each other to ensure that they can rely on us for years and years to come.

And we're holding up our end of the bargain by providing the engineering firepower and targeting R&D and supply chain investments to continue creating value for our customers. Notably, with the recent addition of Maxim, we now stand at 11,000 engineers strong, with more than 1,000 of those engineers focused on developing software and system solutions. And we're continuing to invest in this area to extend our gravitational pull for the world's best technologists.

Now at our last Investor Day, I presented our up the stack vision for how we plan to extend our core capabilities across the base in analog technologies and widen also our aperture to encompass more software and digital technologies. Now today, I'm going to share the progress that we've made and give you a sense of what our expanded capabilities mean for our customers as we deliver the plug-and-play embedded solutions they need at their application interface.

This evolution is opening significant SAM expansion opportunities as our customers shift the way they interact with our technology towards solution stacks that more completely solve their full embedded systems challenges.

Our core technologies provide the critical high-performance technology foundation that enables ADI to address the tens of thousands of customers and hundreds of applications that form the core of our business. They are also the catalyst for higher-level conversations with our customers. In essence, our core technologies are the source and the starting point of ADI's success. Keeping this franchise fresh and vibrant is job number one from an R&D allocation perspective.

Now in our broad markets, we're increasingly delivering flexible software-defined solutions for our customers to make it easier for them to choose and use ADI solutions. As an example shown here, this is Apollo, it's a high-speed signal chain platform that we are designing in with customers in the aerospace, instrumentation, communication spaces.

Apollo is the most complete, most flexible, highest-speed signal chain processing platform ever created in the analog semiconductor sector. The specs are really, really incredible for this product, with data conversion speed of more than 20 giga samples per second, 75 DB dynamic range, almost 3 billion transistors and more than 1.5 million lines of embedded code. It provides unprecedented level of performance and integrates all the signal processing that previously would have required power-hungry FPGAs. This yields a 10x reduction in power, reduced cost and a faster time to market. It's a great example of going where nobody else has yet gone.

Now most importantly, this solution is applicable to literally thousands of customers. And its superior programmability right out of the box will enable our customers to rapidly differentiate and add their unique value in their products. This is the future of the broad market, highly functional, flexible platforms that are broadly applicable.

Now an example of where we're delivering value in more vertical applications is our 5G Open RAN radio unit platform, code-named Kerberos. It is the first complete 5G Open RAN compliant radio unit development platform on the market. It builds off our market-leading software-defined transceivers for 4 and 5G radio units, where we have today more than 60% market share.

Kerberos' next-generation software-defined transceiver is an engineering marvel in itself and represents a step function change in our digital capability. It includes a fully programmable application layer and a complete software stack for the radio unit, which leverages machine learning techniques to optimize the power amplifier. It's also an example of how we're delivering more complete solutions and how it pulls in our core technologies, in this case, all the power, clocking and RF around the radio unit. And you'll hear more from Greg later on this particular topic.

Now as a purpose-driven company, we view our innovations and customer engagements through the lens of the larger impact we can have on the world. We're increasingly focusing our innovation and applying our technologies to solve not only our customers' but also society's greatest challenges. For example, we're helping tackle climate change by enabling the transition to electric vehicles. Autos equipped with our battery management systems are avoiding 100 million tons of CO2 emissions annually. Or consider the impact of our precision signal chain and power management technologies are having on reducing energy consumption by almost half in factory lines.

And beyond the health of the planet, we're improving human health by, for example, reducing the secondary impacts of health care delivery. Our photons to bits technology has contributed a significant reduction in patient radiation doses over the last decade, and you'll hear more from Pat O'Doherty this in just a while. And as you can see, our ESG commitments are an integral part of our business strategy and not merely an addendum.

So today, I've shared examples with you of how we're moving up the technology stack to deliver more complete solutions for our customers. This is our long-term vision. In action, we're going to empower the intelligent edge through the world's most innovative analog, digital and embedded software solutions, all the while working with our customers to make it easier than ever to choose and use our products. And we'll do this while continuing to drive growth and profitability by solving our customers' and society's most challenging problems.

So in closing, I've been in this business a long, long time, more than 33 years with ADI, but I believe our best days are still ahead of us. We'll continue to capitalize in the investments we've made across our portfolio, go-to-market and manufacturing operations to accelerate our growth and extend our market leadership. Most importantly, we look forward to being at the vanguard of the digital edge revolution in health care, communications, transportation, advanced manufacturing and all the markets in which our unique positioning and capabilities can ignite human breakthroughs.

So with that, I'd like to turn the podium over to Karim Hamed, who runs -- he's the leader of our instrumentation business. There is a phenomenal growth story associated with it and a very, very bright future. So with that, I'll leave you in the hands of Karim.

Karim Hamed

Thank you, Vince. Good morning, everyone. Thank you for joining us today. I'm Karim Hamed. I'm the Head of the Instrumentation business unit. I came to ADI roughly more than 7 years ago through the Hittite acquisition. So I'm here today to talk about our test and measurement business, provide you guys with some color about our position in this market and the drivers that keep us excited about the future growth potential. I have a few slides, so I'm going ahead and dive in.

So with over 20,000 customers and 30,000 SKUs, instrumentation is one of the broadest and the most diverse business within Analog Devices across customers, regions and technologies. It's a performance-driven market simply because test instrument has to have better performance that was being tested. And ADI's most complete portfolio of high-performance analog and mixed signal, strengthened by our acquisition of Hittite, LTC and Maxim, puts us in a unique position to be the market leader providing test semiconductor solution for the test and measurement market.

The business is roughly $1.4 billion divided across 3 segments. The first is our automatic test equipment, or ATE, and this cover high-volume manufacturing test for portable devices, for semiconductor and for system-level board test. The second piece is electronic test and measurement, or ETM, and this covers instruments that's used in R&D labs and in the field deployment. And the third is our scientific instruments, and this is used in pharmaceutical, environmental monitoring and geological exploration.

The breadth of the technologies, the diversity of these applications really benefits from the full breadth of ADI technologies, from precision technology, power, high-speed converter, RF and microwave and millimeter wave. This technology richness is the true differentiation of ADI. Our customers value the breadth of our portfolio and our technology innovations. And this is reflected on how we grew this business at a double-digit CAGR over the past 5 years at margins well above corporate average.

So looking ahead, the instrumentation business is well poised for continued growth, driven by 2 main vectors. The first is the business is one aligned with all the secular trends. From electrification, connectivity, AI and machine learning, all of these applications require reliable and efficient testing throughout the development in R&D, manufacturing and deployment, and we are enabling this.

Second -- the second vector is the technology, as shaded with these megatrends, are growing more complex, and hence, require more testing and more demand for ADI technology. And to give you a few examples, the move to finer node geometries in semiconductor enable engineers to integrate more functionalities within a single chip. This requires more testing, this is increasing test time and hence more content for ADI technology.

Similarly, in communications, 5 years ago, we're testing 3G, 4G and the base station or handset and maybe WiFi 3 or 4. Fast forward 5 years, we are testing 3G, 4G, 5G low band, 5G high band, ultrawide band. So all of this increased technology content drives the demand for more test, and again, more content of ADI. So these 2 vectors combined gives a SAM that's growing very healthy at the high single digits to $6 billion plus by 2027.

I talked about how our acquisition strengthened our position in test and measurement market. And these 2 simplified block diagrams of a digital ATE test and an RF test for an ETM is a good illustration of this where you can see that the addition of Hittite, LTC and Maxim had a significant bump content, over 50% of shares to ADI.

Simply, if you look at any of these block diagrams, starting from the left, you have a digital fabric, whether it's an FPGA or an ASIC that do the computer and the digital signal processing, but the rest of the signal chain is solution from ADI. And we're talking here that when we sell to these boxes, there's like tens and hundreds of ADI components in each of these boards.

So our ability to really optimize these signal chains, our ability to make this interface between the different blocks seamless and, most importantly, optimize the performance, again, it's a performance driven market to get what we call instrument-grade performance, is our true differentiation. And the customers really value this because it enables them to get to market faster, and it enables them as well to reduce their R&D spend. This has been reflected in our position in this market, where you can see that our share is far exceeding our nearest competitor in both ATE and ETM.

I will now switch to how secular trends is impacting instrumentation business. Again, I have a few examples, starting with comms test. Comms test has been a growth driver for our instrumentation business historically, and we expect that this momentum will continue in the future. Generally speaking, our comms test businesses has 2 main buckets. The first is around, again, high volume production. And this is the testing of semiconductors that goes in base station or handsets or testing portable devices or tablets and phones and so on and so forth.

The second piece is around the instruments, the field instruments that's used when an engineer or technician is installing a base station and measuring the componentry of this base station, or testing like data integrity and signal integrity for data centers.

So the continuous evolution of 5G, the emergence of 6G R&D, a new application like LEO SATCOM, explosive growth in data centers and new wire standards, like terabit Ethernet, and PCIe Gen 6, all drive the demand for new test requirements, which presents a growth opportunity for ADI.

In addition, the technology I showed you with the comms, like the use of massive MIMO and phased array in wireless or the expanded use of high-performance compute in data centers, that drives the demand, again, more testing and more test time, which is a challenge for our customers but an opportunity for us. Because with our technology innovation, we're able to double the density per tester and in some cases quadruple the tested density, which means higher throughput and a path to test parity.

So overall, we're very confident about the growth ahead of us in our communications test business and we expect to then double this business over the next 5 years.

The second example I'm going to talk about is our automotive test, and the industry pivot to electric vehicle and autonomous vehicle represents a great opportunity for our instrumentation business, which we are well positioned to capture. The increasing demand for EV drives massive R&D innovations in drivetrain from battery, battery packs, inverters, traction motors and charging systems.

So consider an engineer developing an electronic control unit, or an ECU, for an automotive inverter. He or she will need to validate their subsystems before they get put in a car. The interconnects, the surrounding interconnects need to be emulated to test worst case condition to ensure performance, robustness and safety.

Our power, precision and isolation technology are at the heart of those digital twins and test systems. Same thing for autonomous driving. Again, efficient testing requires to test radar, LIDAR, camera-based systems. And again, our RF high-speed converter technology are at the heart of those ADAS test systems.

Finally, as the increasing content of semiconductor in a car, that provides a strong tailwind for our ATE business, which is our semiconductor test, where our technology innovation in digital test and high-power device testing will be well positioned to capture this growth.

So overall, we are very excited about the growth ahead of us on automotive test. Our SAM is growing at 3x. Our technology position will enable us to capture this SAM and even grow our share.

So up until now, I've been talking about testing electronics and measuring electrical performance, I'll are now switched to our scientific instrument, where we're testing and measuring molecules and physical property.

Our scientific instrument business extend our reach to human health and sustainability where our technology is at intersection of molecules and data. Technology innovations in drug discovery, environmental, genetic science and genetic therapies and drug manufacturing all rely on high-performance instrumentation, accurate instrumentation that's enabled by ADI technology. Our pedigree in precision, power, technology continued innovation and now with the Maxim processor and security option, we enable our scientific instrument customer -- the data generated by our scientific instrument customers becomes reliable and secure. This gives us a very unique position to not only capture the SAM growth, but also expand our share.

Furthermore, as society tackles reduced CO2 emission, improve water and air quality and higher food standards, again, the demand for highly reliable and accurate instrument that drives actionable insight is paramount, and ADI technology is critical to the environmental monitoring. And to give you an example, our latest technology of ultra-high-precision converter enable 10x the measurement resolution of fine particulates. This helps prevents the adverse effect of fine pollutants in human and plant health.

So overall, our fingerprint is everywhere across scientific and environmental monitoring, scientific instrument and environmental monitoring and we're very confident about our growth ahead.

So in closing, we are very excited about the growth ahead of us in instrumentation. Everything needs to be tested from transistors to data centers, from portable device to EVs, and we are well positioned to capture this.

I want to leave you today with 3 key takeaways. First, instrumentation is a well-diversified business that's well aligned with all the secular trends. Second, our technology innovation and our breadth of our technology is our key differentiation and we're well actually suited for this market as well. This provides a growth opportunity for us, because technology is growing more complex, needing a much higher volume, requires demand for more test and enhance more demand for ADI technology.

And with that, I'll leave you to Jen Lloyd to talk about our industrial automation business. Thank you.

Jennifer Lloyd

Good morning. It's nice to see everybody. My name is Jen Lloyd. I'm proud to say that I've been with Analog Devices for 24 years. I'm currently located in our Silicon Valley offices. But it's great to be back here in Wilmington where I started my career.

Here at ADI, I'm a leader in the industrial and multimarkets team, and I'm responsible for our technology platforms. Today, I'm going to talk to you about our automation business.

So automation is about a $1.4 billion business. This is about 25% of our overall industrial business. There are really 3 main applications: process control, connected motion and robotics, and building and infrastructure. And these are impacting end markets from automotive manufacturing to food and beverage to hospitals. We serve this market with the broad ADI portfolio across a large number of customers in very sticky, very long life cycle applications.

And finally, our domain expertise. This is really key to our partnership with our largest customers. Some of them are here today, and we're excited to welcome them.

Today, I want to zoom in and talk about the factory floor. This is where several secular trends are driving digital transformation. So I'm going to focus on 3. First is the move to net zero. This trend is a key enabler of digitizing the factory floor. Companies are really having to rethink their operations to have a lower carbon footprint. Net zero is also creating new markets, renewable energy, electric vehicles, and this is requiring new factories and more CapEx-intensive automation to create the end products.

Second, reshoring is driving new automation investments as manufacturers are looking to mitigate labor supply constraints and supply chain risks.

Finally, labor shortages are significant. So over the last decade in the U.S., the growth of the nonworking age population has outpaced the growth of the working age population, and this is creating the need for new solutions.

To realize the benefits of digitization of the factory floor requires a lot more sensors. These are used to optimize efficiency and productivity. Every one of those sensors requires a high-performance signal chain to go with it, and this is an area where ADI is a leader in our core precision and power technology. Accuracy in manufacturing is going up with tighter tolerances and faster control. This is driving up the performance requirements of the signal chain technology. The higher precision can mean less materials loss in milling applications or, say, better mix control in food and beverage.

I'd like to give an example here of a SICK sensor. The signal chain for this sensor includes 35 of our high-performance components, from converters to amplifiers to power and processing.

So the digital factory is driving some exciting new technologies, which I'm going to talk about next. But I want you to remember that our core franchise also really benefits from the transition to Industry 4.0.

Unidentified Participant

I'm sorry, what does the SICK sensor do?

Jennifer Lloyd

It's a factory sensor. So it may be measuring -- it will be measuring some parameters of an instrument.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We'll do the demo of it a little later.

Jennifer Lloyd

Yes, I should have mentioned that there is a demo. Okay.

So the smarter digitized factory is networked to enable communications between all those sensors as well as robots, controllers and other intelligent devices in the factory. So with the number of sensors and devices increasing, the amount of data flow is also increasing. And this data is going across multiple types of communication links.

The real challenge is operating reliably in this very harsh environment, which may be electrically or mechanically noisy or high temperature, and ADI really has years of know-how to provide the solutions to these challenges.

Now with the Maxim IO-Link technology, our complete portfolio of robust communication solutions serves all link types, operating at data rates from kilobits to gigabits. With this move to more robust connectivity solutions like gigabit Ethernet and the IO-Link, we now have the opportunity to sell 3x the content versus traditional links like 4 to 20 milliamp. And these anchors give us the opportunity for pull-through of the signal chain,

such as switches and processing. Now keep in mind, connectivity is both a brownfield and a greenfield opportunity, so upgrading existing infrastructure as well as in new infrastructure.

In the digitized factory, the amount of sensing is expanding, the demand for data communications is increasing and the edge devices are upgrading with more sensors, more power management and more connectivity. And I think a really great example of that is in the robots, where the silicon content is really exploding.

So in the new factory, even the big traditional industrial robots are getting an upgrade. To optimize efficiency, safety and productivity, there needs to be an increase in sensing and this creates more data. This is driving an increase in signal chain and communications content over the content that we have today.

In the last 5 years, the use of robots has nearly doubled, and there are a couple of growth areas I'd like to highlight. Cobots, these are robots that work alongside humans, and we had some demos of these downstairs; and autonomous mobile robots or AMRs, these move around on the factory floor. Both of these are now allowing manufacturers to do more with less. They can automate dangerous or difficult tasks to augment human work and make that work safer.

Not only are there more new robots, but there's significantly more content in these robots. Traditional robots rely on ADI's core portfolio of power and signal chain devices. The new robots do also, but higher levels of safety in cobots, which work with humans. This translates to the need for more types of sensing. The mobility of AMRs requires now navigation sensors and safety curtains for sense technology is required to prevent bumping with other robots or other humans.

So you can see in the graph, we are estimating that an upgraded robot will have about 25% more content than a traditional robot and AMRs will have even more, up to 1.5x the content. So not only are there more robots and more content, but these new robots are also easier to install and more flexible than traditional robots, and this is enabling new applications for automation and reducing total cost of ownership for manufacturers.

So I talked a bunch about robotics, but I want to also mention that field instruments and process controls are also getting smarter and more connected, and this means more content for ADI.

So I want to give a couple of examples of what the digitization of the factory enables for manufacturers. And the first example is around a trend that really promises to drive greater efficiency for manufacturers, and that's the digital twin.

So a digital twin is basically a live replica of the factory floor. And it's created from sensors and configuration data that feed into a software model. So this model can now be used to safely run experiments and scenarios on the factory without having to take the sibling offline to do so. So manufacturers now can make decisions about how to optimize or configure the factory before changes are actually made in the actual factory.

Condition-based monitoring is another important capability of the digital factory, where motors and drives can be outfitted with sensors, and this can provide real-time updates on the state of health. These sensors could be measuring vibration or temperature or sound. And using that data, the assets now can be evaluated for failure or repair need.

The next generation of this technology is even more exciting, where it's more predictive, it can use AI to anticipate failures before they happen and reduce downtime. This kind of predictive maintenance can enable 10% reduction in maintenance costs and a 20% reduction in downtime for manufacturers.

So sensing and intelligence at the edge throughout the factory can produce insights quickly, this can enhance safety and can reduce power consumption. In fact, edge-based analytics can reduce power consumption by as much as 98% versus comparable cloud-based solutions, and ADI has all the technology to enable this edge-based intelligence.

So I want to leave you with a few key points. The first is ADI has a strong position in the complex industrial automation business. Secular trends are driving digitization of the factory floor. Our signal chain and power franchises really benefit from this digitization trend. And new applications are

emerging with increasing levels of ADI content and generating more data. So intelligent and efficient use of this data is opening up really exciting new opportunities for our end customers to upgrade and create new factories of the future. Thank you.

And now I'd like to introduce my colleague, Pat O'Doherty.

Patrick O'Doherty - *Analog Devices, Inc. - SVP of Digital Healthcare*

Thank you, Jen. So good morning, everybody. My name is Pat O'Doherty, I'm responsible for leading our Digital Healthcare business unit. So I'm another ADI veteran. I've been in the company a long time. I came in as an engineer and served in a number of roles in the engineering side of things, both in the front and back end, which means working in wafer fab. And then went into manufacturing and marketing, and then got to lead several of our businesses before culminating and leading the digital healthcare business.

So today, I'd like to give you an overview of that business to explain our strategy, to explain what's driving our strategy in the market today, to show you some results from it. And maybe overall, to give you a deeper glimpse into what constitutes this business, which we view as a very high-growth business and a great fit with our technology.

So first, the overview. So digital healthcare, as you all know, is reported as part of our industrial business externally. Internally, it's a separate business unit. It's $800 million in revenue. We're the market leader in medical imaging, medical instrumentation and vital signs monitoring. Those 3 make up -- those 3 segments make up the business. And they're about roughly of equal size, as you see.

We have thousands of customers. We enjoy margins that are well above the corporate average. So in that way, it's similar to industrial in terms of the makeup. One of the things that distinguishes this, obviously, apart from the end customers and the end equipment, is that we have a very high concentration of our revenue within the top 10 customers.

And that's a result of a strategic effort that we have -- where we have focused on very high what we call ASSP products, which are application-specific standard products. These are more complex, more system valuable products, and we have been focusing on that for about the last 10 years and have seen some great results from that, that I'll share with you in a minute.

The other thing that's of great interest, I think, with this business is that our top customers align perfectly with the largest medical equipment manufacturers in the world. And so that is a testament to the fit of the technology and to the strategic focus on meeting these customers' needs.

Okay. So just to step back for a moment and talk about at least one of the market drivers that is really impacting everything that happens in healthcare today. So the U.S. leads the world in healthcare spending. Unfortunately, we don't lead it in terms of enjoying the outcomes of that spending, but we lead it in terms of spending. And so I'll use that as a kind of a surrogate for what's going on around the world, but really the trends that the U.S. is experiencing in slightly different ways are being experienced around the entire developed world at the moment.

So we spent $4 trillion on healthcare, which is an astonishing number, 20% of GDP, and it's been steadily increasing over the last several decades. It shows no sign of turning around. So as much as -- this is going to continue, we expect it to continue to outpace GDP. And what's behind that is we have an aging population, as you all know. And we have the increasing occurrence of chronic disease amongst that population. And these are things like diabetes, heart disease, various other conditions.

And a statistic that is not well known is that 90% of that spend is spent looking after patients with chronic disease, which is absolutely amazing. And the proliferation of it, we've got 6 out of 10 Americans that are suffering from some chronic disease condition. So there's going to be no change in the cost pressure that we're facing.

And then on top of that, you land the pandemic on top of this healthcare industry, and that stresses the antiquated delivery system that we have today for healthcare, where we put all of our expertise and all of our equipment concentrated into large hospitals. And then a pandemic hits, and we send all the people who think that they're very sick to go into those places that are full of fragile patients and our most valuable clinicians.

So that system, for a number of reasons, can't continue. And I know you've been hearing this for a long time, it can't continue, but there are several efforts underway today that are trying to address that. Those efforts are regulatory. There -- the insurance payers are very focused, as you might imagine, in trying to address this. But then the area where we can contribute is technology, because one of the key things that's missing today is to provide clinical grade vital signs monitoring technology that can go into the home and can look after patients just as well in the home environment as we can today in the hospital.

So if we look for evidence of is this happening instead of me just talking about it, this chart on the left is trying to give you just a feel for that. So medical spending has grown at a 5% CAGR. Medical application-specific standard products from the industry are growing at 3x that. So I think that's a solid indicator that our industry is pretty good at finding opportunities. So 3x the growth of the overall health care industry.

And in ADI, where we kind of -- well, not kind of, we did recognize this very early, we're experiencing a 24% CAGR over the last 5 years on our more highly integrated application-specific medical products. And so we looked at that, we've seen the results and we decided to double down on that investment. And I'll show you some of the results of doing that.

So let me go into each of those 3 segments one by one to just give you a feel for what I mean by application-specific products, which are really edge processing products. Vince talked about edge processing as being the next wave, and you'll see that throughout healthcare, we're focusing very much within large systems and small systems, doing products that complete the function of edge processing.

So in medical imaging, we're the overall market leader today. In CT and digital x-ray, we dominate those markets. And the way that we've done that is by focusing on the end system. So we always had a great play in terms of selling high-performance components to these manufacturers. But we looked at that and said, we can do better. We can provide more value to them. And so we looked at pulling those building blocks together, engaging deeply with our customers, because you can't go away and think very hard about what a CT scanner needs, you've got to go and engage with the experts.

So we built up domain intelligence of what those systems really need and combined it with advanced packaging, and Vivek is going to be talking about our advanced packaging strategy later in the day. So basically, we're combining critical functions in this system together and providing them in a tileable module.

So what you see in the bottom left, it's a little hard for you to see, but that is a photons-to-bits module. So that 640 pixels. It's a light-to-digital converter. It contains x-ray shielding. It contains all sorts of signal processing to be able to take the analog signal in light form provide -- do the digital preprocessing to get it over to where images can be constructed.

So in a large CT scanner, the image quality is entirely determined by that module. And so that obviously commands high value. And we sell hundreds of these modules in every CT scanner that's shipped today. And so you can imagine the value really does multiply out.

So it provides several benefits. So one is to patients, Vince mentioned this morning, they experience a lower x-ray dose, which is a major concern. Physicians and patients get the benefit of the best quality images. Customers get a lower cost, smaller footprint solution. They get lower time to market, because we're doing the development instead of their engineers. And there are other benefits that we -- the work done as we got into this, and that's ease of maintenance, for example. These tileable modules can easily be replaced if anything goes wrong with the system.

So what benefit does ADI get? Well, we get about 4x the SAM that we used to enjoy from our components. And we had a really strong share of the CT component play. And so we're providing more value. We're capturing 4x the value that we did before. And these are sophisticated customers, so you can only capture your value if you provide it and so it has done really well. And it increases barriers to entry because what we're providing now is so critical to the performance of these systems that it's a very, very disruptive thing to try and replace it or change it.

And just in case, in your minds, you're probably thinking, okay, well, that's the big box, high CapEx, medical equipment and maybe it applies there. I'm just giving you an early look at a handheld ultrasound system as you see in the bottom right-hand corner there. And that's echo-to-bits technology. So it's a -- in thought process, it's the same as the photons-to-bits process -- or strategy, but it's applied to handheld ultrasound.

And this is where we're doing all of the signal processing from the sensors through beam forming, through the digital processing to be able to enable cart-based or clinical-based high-end ultrasound in the handheld format. And that will be the first time that's ever been provided. So the category exists today but it is limited in function, and this is going to open up that tremendously.

The second segment that we serve is medical instrumentation, and this is the broad swath of applications from infusion pumps to diagnostic testers to ventilators to defibrillators. So this is where ADI's broad technology portfolio really comes to play. And the business units, we spend our time putting those products together, they're developed all over the company, but putting them together so that we're providing full signal chain solutions that we're bringing in power and signal chain and doing all those functions -- providing customers with all those functions together. The days of kind of completing one product at a time kind of over at this point.

So that's the breadth of our technology. But in addition to that, we do focus -- even in this area, we do focus heavily on deep verticals. And so we would pick segments where there's high growth, where there's a great fit with our technology and where we think we can really have an impact. And two of those I'm showing on the top there. One is robotic surgery and the other is dialysis, where we're providing biosensing technology to really improve dialysis, both hemo and peritoneal dialysis.

And so these are going to increase our SAM by doing these deep dives in the same way that I explained in medical imaging. It's where we're providing more sophisticated products, higher value to the end system, and that combines with the foundational technology that we have.

The third market is VSM or vital signs monitoring. And it's a complex market, so that we kind of took a simplistic view of it here. But really, the market challenge today is even in the hospital, and this is something that people don't realize, that 98% of people in the ward, so outside of the OR and ICU, are not continuously monitored. So the way they're monitored is a nurse comes in, interrupts you, takes your vital signs and goes out again. So that's a very inefficient way and a very uncomfortable way of having -- of monitoring people. And very inefficient because people are brought into a hospital to be observed, and basically between those checks, they're not being observed. And so that's one opportunity.

The other factor is that consumer wearables, as much as they've made great strides in adding vital signs monitoring technology and some of it even FDA certified, they really lack the functionality and performance to be able to do clinical grade monitoring. That space today is still unaddressed.

Clinical monitoring is very much embedded in those high-intensity areas and hospitals. The wellness devices that many of you are wearing today are making progress, but there's a huge gap. And that gap is likely or almost certainly going to be filled from the right-hand side, from the clinical side rather than the left.

And so Analog Devices and Maxim, this is the area where the combination of the two companies has made such a boost to our digital healthcare business. The legacy Analog Devices, we were a leader in the hospital, all the bedside equipment is ADI. We have wearable technology as well, it's more clinical in nature. Maxim had focused on wearable devices, wellness devices. Many of you are wearing them, as I say.

So that combination gives us the capability to take low power, low cost, small technology, improve the performance and go after this clinical space. And so we're working on that right now. We've got a huge investment in that area. We're going to have patch-based platforms, risk-based platforms, and we're going to be able to go after some of the biggest problems today in that area.

So the last segment. So I only -- if you remember, I said there were 3 segments of this market. This is the emerging segment now. This is where we're taking an additional step-up in terms of integration and in terms of complexity of product offering. So we're developing products today that incorporate hardware, software, cloud connectivity, cloud-based analytics and service. And if you think about that, so that is quite a reach forward.

Now as we look at it, it's merely the next step in integration as we've gone up the stack, as we develop more complex products. So from the actual physical product itself, it isn't a huge risk. But obviously, these are new markets, it's a new product offering, but we have been working on this for a number of years.

So we're not doing it alone either, obviously. We're working with an ecosystem, with people who specialize in various areas here where it hasn't been in our history. And so we have a full pipeline of products coming that we're working on. And the first one we expect to come out within the year.

So the target of these products really is to, as I kind of alluded to at the beginning, is to proactively manage chronic disease patients using technology and to replicate what those patients -- the care that those patients get in the hospital, but to do it at home. And thereby prevent unnecessary hospital stays. And that's the huge benefit that this technology can provide.

So results to date from doing this. So I didn't want to leave you with we're planning on doing this and things are going to get great. So this is looking back over the last 10 years. So the first thing to note is we're in the seventh straight record revenue year. So this business is on a roll. And remember, it's one of our highest gross margin businesses.

So about 10 years ago, we started this path of going up the stack in health care, and we started developing more sophisticated silicon, then these advanced modules. And the growth -- the difference in our growth has been very dramatic. So we moved from single-digit growth to double-digit growth through this 10-year period up until '21, and that's because of the addition of subsystems or ASSPs.

And so now as we go forward, and add to that, the next step up in integration with system-level products, we expect that growth to accelerate further. And the addition of Maxim, particularly in the wearables space, bringing us not only signal chain, but power capability is a powerful combination for us.

So just to close, we're seeing increasing digitalization, which is really a focus on that digital edge, across all of our businesses. We're serving a wide array of applications. They require the portfolio breadth of the company, and we're also combining that with diving deep into the areas where we're accumulating domain intelligence. The combination of ADI and Maxim is making a huge impact.

And really, if we look forward, we expect a continuation of the growth that we're experiencing already today. You remember at the outset, I said that this ASSP sector was growing at over 20% per year. So what we're forecasting here is a continuation of that. Really, there's a large upside to that, with many factors feeding into it. So I'm really excited about this business and I hope I managed to convey that to you.

So now I'm going to hand it over to Greg Henderson, who's going to talk to you about our Wireless Communications business. Thank you.

Gregory N. Henderson - *Analog Devices, Inc. - SVP of Automotive, Energy, Communications & Aerospace Group*

Good morning. It's great to be here today and see so many of you in person.

I'm Greg Henderson. And for a little bit of context, I've been at ADI for about 8 years, where I came through the Hittite acquisition. And I'm responsible for the Automotive, Communications and Aerospace business group. And my colleague, Patrick Morgan, is going to talk about the Automotive business today. I'm going to talk today about next-generation communications, and specifically about how Analog Devices is enabling the future of wireless communications.

So when we talk about wireless communications at Analog Devices, we're talking about wireless infrastructure, and we've been in this market for many generations. And the technology that's going to drive growth in wireless infrastructure for the next 5 years is 5G. And I'd like to start by talking about how we see the market for 5G. But before I talk about the market for 5G, it's helpful to look back and see how the market on 3G and 4G has evolved because that can give us some context to understand how we think 5G will evolve.

So if you look back on each of these cycles, each of these cycles was defined by a key capability that was created through the network. In the case of 3G, it was the mobile data. So this was the advent of your smartphone. It was your iPhone and your smartphone. In the case of 4G, it was seamless mobile video and data. So it was a more seamless mobile multimedia experience between video and data. But both of these cycles were designed -- defined by these basically consumer capabilities. And because they were defined by these consumer capabilities, they had the cycle that's typical on a consumer cycle, they tend to rise relatively quickly and fall relatively quickly.

5G will also have consumer use cases. It's going to have more seamless multimedia and metaverse use cases and actually most of the growth in 5G to date has been driven in the early days by these consumer use cases. But the key of 5G is that the network capabilities are different. And the network has key capabilities that unlock new use cases. That's massive machine connectivity, ultra-low latency and network slicing. And these network capabilities are unlocking new B2B use cases, like industrial automation, robotics, telehealth, smart highways.

And these B2B use cases have yet to happen. And we believe and many analysts believe that this -- these B2B use cases are going to drive significant growth in 5G and make 5G be a longer cycle. As a matter of fact, Light Reading predicts that by 2035, the B2B use cases might outpace the consumer use cases in revenue for 5G. So in that reason, we believe that it's going to have a longer cycle.

Also, the network architecture of 5G, we'll talk about that in a minute, lends itself to private network. So now a private enterprise, a factory or utility could build a private 5G network, and that's another growth driver on top. So for these reasons, we think 5G is in the early innings and is going to grow and have a longer cycle due to the fact that it's more of an industrial cycle in the back end.

A different way of looking at this is on the right hand of the side of the chart, you can see that most of the growth in 5G to date has been in Asia, with a little bit of 5G in the rest of the world. There will still be growth in Asia, but the vast majority of 5G over the next 5 years is going to be in the rest of the world, which is really trying to catch up with some of the deployments in Asia, and then we see the 5G private networks rolling on, on top of that.

I'd like to move down -- one level down and talk about the radio access network, and this is where Analog Devices plays. And specifically, what the challenges that the carriers are having in deploying radio access networks. And there's two key challenges I want to talk about today. The first is about the complexity of the radio spectrum. So if you look back in the days of 3G, there was about 10 to 15 frequency bands that these radios would have to operate in. And obviously, they have to operate on those bands and be able to coexist.

In the case of 5G, there's over 60 frequency bands that the radios have to be able to operate in. And so the carriers need radios and all these frequencies. And also, if you look up a tower, there's a lot more equipment on the tower than there used to be. So it's not just operating in these frequency bands, but it's operating in these frequency bands with interference that could come from other things that are on those towers. So the radio environment in 5G is significantly more complex than the radio environment was in the past.

The second challenge that carriers have is sustainability. So we're all trying to figure out how to get to this net zero world, and power consumption of the radio access network is a big deal for carriers. A large carrier could spend thousands of gigawatt hours -- consume thousands of gigawatt hours per year on power consumption. And that cost of that power consumption -- and that's just for the radio access network. The cost of that power consumption of the radio access network could be 5% of their overall operating costs for the year. So it's really a big deal.

So carriers are trying to figure out, okay, how do they deploy in the complex RF environment in the most sustainable way possible. And this has resulted in a lot of different use cases of equipment that you may have heard about. So starting on the chart, if you look up at the top there, the first use case is a macro base station. This is a relatively large base station typically goes up a large tower, reasonable power consumption, a very good coverage area and a moderate capacity. So it's used for kind of large coverage on big towers.

Next, you have small cell. Small cell is exactly what it might sound like. It's a smaller footprint base station, it has a smaller form factor, lower power consumption, it has a very high capacity but a relatively low coverage area. So it's good for filling in coverage or in high-density areas. It's used in buildings.

Then you have massive MIMO. Massive MIMO is kind of the combination of the capabilities. It's like a macro base station in coverage, but it has capacity like you'd get in a small cell. The trade-off in Massive MIMO is at a much larger form factor and uses a higher power consumption. So this is good in dense urban environments where you want a combination of both capacity and coverage.

And then finally, a millimeter wave. Millimeter wave is like an ultra-small cell, very high throughput, very small coverage radius, typically good in places like stadiums.

So ADI's strategy is to build the core technology that enables all these use cases in the most seamless way possible. I'd like to move in and talk about that now.

I'd like to talk a little bit now about the 5G network and how the network is evolving. And before I can talk about the network evolution, I'd just like to anchor you on the legacy network that it's evolving from. So on the top of this chart is a very, very simplified diagram of a 4G network, say, circa 2018. And in this network, you would typically have a core. The core was a rack of equipment, hardware and software, dedicated hardware and software, that would sit in some data center, and then be connected through some wireline network to the radio access network.

The radio access network at the edge is a bunch of base stations. Inside those base stations, you would have a combination of edge digital processing and then the radio transceiver solution. The edge digital processing inside the base station was typically custom-built hardware and software that was built by our customers or some partners, and it would be specific for each of those base station use cases.

We've talked in the past about how ADI was first to market with a software-defined transceiver to greatly simplify the RF design of these base stations. So we have a single-chip solution, multiple frequency bands, you could do on the same chip. A single-chip solution could cover all the frequency use cases and actually the equipment use cases on the previous chart. We were first to market with that. We were a market leader with that.

But when I talk about how the network is evolving, the way the network is evolving in 5G is through virtualization. You've probably heard about virtualization in many markets. Well, it's happening in 5G as well.

First, the virtualization is happening in the core. So now in the core network, instead of being a dedicated set of hardware that sits in a data center, the core can be virtualized. And the core can be a set of software services that run in the cloud. And that gives a lot of flexibility to the carriers in having a more scalable and flexible core. As a matter of fact, some of the cloud service providers have announced that they're going to host wireless cores in their standard cloud service offerings.

But it turns out that some of the digital at the edge can also be virtualized. And so you can take some of that digital processing at the edge and instead of being custom built in the base station, you can virtualize it on edge processing. And that provides another big advantage to the carriers as they're deploying these networks, because now you can share those edge processing resources among the different radio units, it gives you a lot of scalability and efficiency.

But some of that digital can't be virtualized, and that's the digital that sits close to the radio unit. Typically, it's the high data rate, it's low latency, it has to be up the tower. So what we've done in our latest generation solution is we have created a single-chip radio solution for the massive MIMO -- I'm sorry, for the macro and small cell use cases, our single-chip radio solution allows customers to build a radio unit basically with that single chip, greatly easing the design and integrating the digital that can't be virtualized.

To go down one level and talk a little bit about what's inside that, I show a chart that shows the evolution of this technology. So if you go to the left-hand side of this chart, you have the technology circa 2018, that was our software-defined transceiver. Typically, that would sit next to 2 large chips from our customers or partners, digital front end and a low Fi, and I gave in some anchor performance there in 2018. It was a 2-channel solution at 200 megahertz of bandwidth.

Moving into 2020, we integrated our first part that had some levels of digital integration. We integrated the digital front end. It was a 4-channel solution. And inside our solution, the power per channel was half, which was kind of a big impact to customers as they're trying to get to that sustainability goal.

And finally, our latest generation solution, we have an 8-channel solution that, as compared to 2018, has 4x less power and twice the bandwidth in that -- in our part of the radio solution, and we've integrated all that digital.

And you heard Vince mention in his presentation, one of the key focus in this design is to power consumption because it goes to our customers' sustainability impact. And we will be the first to market with a machine learning-based linearization that's in that digital front end. And that machine learning is not just linearizing our part, but the rest of the radio system as well.

And if you look at the impact to our customers, the overall system base station has a performance benefit on the bottom. Twice the bandwidth 35% of the overall power reduction in the base station and 75% overall weight reduction, which is a really big deal for these things that have to go up a tower. So this is the impact that this technology is having, and it's used widely across -- these generations of technology are used widely across the carrier ecosystems in the market.

It turns out though for ADI, there's a benefit to ADI of this digital integration as well. It's easing our customers' design journey. But there's a benefit to ADI that it increases our SAM. And that's because when we have these digital solutions, we have more dollar content in that radio. So we've expanded our dollar content and we are able to capture more value. And the net of this in the go forward is that we think this is a rough doubling of our SAM based on the increased digital content.

If you look back in the past when we talked about our SAM, our SAM was heavily focused on channel count, and that's because we sold that transceiver solution. And because of that, the majority of our SAM came from the massive MIMO use cases, we sold it into macro and small cell, but it was a smaller part of the revenue.

But now that we have the digital integrated solutions for the small cell and macro use cases, we get more revenue when we sell the complete digital solution. And therefore, in the go forward, it's about 50-50 between these 2 use cases. And so we have a net larger SAM and a more balanced revenue for ADI between the different deployment models.

The other thing I'll point out is I talked about the private networks, and these virtualized networks are well suited to be deployed as private networks. The private network use cases are very well suited to macro and small cell. You often don't need massive MIMO because you don't have that density of coverage that you might need. And so as private networks deploy, the small cell and macro use cases are going to deploy further and that will also be good for us based on our market position.

I'd like to talk a little bit about O-RAN. And maybe many of you have heard about O-RAN. O-RAN stands for open radio access network. And very simply, an O-RAN network is just a standardized version of an open -- I mean, a standardized version of a virtualized network. So the O-RAN ALLIANCE, which ADI is members of, has defined standard interfaces between the equipment in this virtualized network. And the latest generation solution I showed you on the previous chart has been designed to support the 7.2 split, which is the O-RAN defined standard for the macro and small cell use case.

So in this way, we've developed this same single-chip radio solution is enabling the O-RAN market and the ease of design. But we're not just developing products for the O-RAN market, we're investing in the ecosystem and in reference designs. And Vince showed you on the previous -- in his presentation, on the bottom left here that's an 8-channel macro base station reference design based on the ADI technology. And the benefit of that is that many of the O-RAN customers are actually taking our reference designs, and we'll take them straight to production.

So not only do we get the increased SAM because we have the added digital content. We have 40% additional content opportunity due to the rest of the ADI content in terms of power, clocks and other analog solutions that are available to us through that reference design. And our solutions are very well represented through the O-RAN networks that have been deployed to date, and we're very active in this market.

Finally, I'd like to talk about one other leverage of this technology, which is that of space. Many of you may have heard about these low earth orbit space networks. These are networks from companies like SpaceX or Amazon or Telesat. And this is a different kind of communication model. So the idea is that you build this network, it has a very large number of satellites that operate at a relatively low orbit. And through that, you can provide global coverage. And you may recognize the SpaceX network has been in the news lately because it's being used for communication on the ground in Ukraine because they have that capability to provide true global coverage.

Because these satellite networks are different and because these satellites are relatively low, they're moving across the sky relative to you on the ground relatively quickly. And therefore, they need a phased array technology to communicate between the satellite and the ground because you have to track the satellite and then the satellite has to track the guy on the ground. So it's a very sophisticated communication technology. And it turns out that, that phased array technology is similar in many ways to the massive MIMO technology that you have in 5G. And because the communication protocols are similar to 5G, and in some cases they are nearly 5G, we're able to leverage our technology significantly that we've developed for wireless into the satellite market.

And these satellites typically have a very large number of channels, a single channel -- satellite could have over 3,000 channels. It provides a content opportunity for hundreds of ADI chips. And the opportunity for satellite is over $100,000 a satellite, it leverages our wireless technology and we're very well represented across the ecosystem as these networks start to deploy. So that's just another growth driver that's driven from this technology.

So just to kind of bring the whole thing home as a summary. First, I just want to reanchor back to the beginning on 5G. We really believe that 5G is in the early innings. And 5G is going to be different than previous generations because of these B2B use cases and the industrial use cases. ADI's strategy is we want to enable the 5G market the same way we've enabled the previous generations of wireless technology. And specifically, we want to enable these private networks in O-RAN. And we're doing that through increased digital integration of our solution that simplifies the radio unit design and simplifies these new network models like O-RAN and private networks. I'll also emphasize that, that digital integration aids the journey of our customer and increases the content opportunity for ADI.

So if you take the things I talked about today, traditional 5G networks, private networks, O-RAN and satellite, these are segments that we believe are going to grow at over 20% CAGR for the next 5 years and are going to be growth drivers for the wireless business and for ADI.

So with that, I'm going to pause and hand it over to Patrick Morgan, who's going to talk about our strategy in automotive.

Patrick Morgan

Hello, everybody. Great to be here. I'm Patrick Morgan, and I'm responsible for sustainable energy and automotive electrification at ADI. I've been in the industry for over 25 years and joined the company 3 years ago from NXP and Freescale, where I led the automotive ADAS business. Today, I'll focus on the overall automotive business at ADI, what's driving the industry and how ADI is innovating to lead the industry towards a sustainable future.

Now let me start first with the impact that our technology creates. The worldwide push for sustainability has never been greater and our technologies make a positive impact not only on the industry, but also on the planet. For electrification, ADI technology saves emissions from gas vehicles, enables the growth of EV fleets and also ships into energy storage systems for clean energy. Taken together, all of these systems save 100 megatons per year of CO2 today and are on track for over 400 megatons per year by 2030, in support of worldwide regulations to limit greenhouse gas emissions.

On the experience side, our technology is gaining strong acceptance in the market and produces a sustainability impact by eliminating wires. In fact, we're on track to save 50,000 tons of copper over the first decade of production by eliminating wiring, using our unique connectivity technology in audio, video and data.

Now as we talk about electrification, let's first talk about the electric power grid. The grid connects all of us in our homes and factories with power supplied by many sources of energy, including clean energy sources. At ADI, we see the grid developing as a complex ecosystem with electric vehicles at the edge. As electric vehicles proliferate, the batteries take a significant amount of energy from the grid from different locations depending on where the vehicles are charging.

Smoothing out and managing the energy delivery to be uninterrupted presents a complex challenge to the grid operators. And as we look to the future, we see the power grid becoming increasingly digitized to overcome this challenge. In fact, in our recent announcement with Enel Gridspertise, this highlights the critical role that our technology plays in smart grid technologies and managing the energy flow.

Furthermore, as we look to the future, EV batteries can become a valuable source of energy back into the grid. And this can be managed and secured in a way that I'll discuss later in this presentation. In aggregate, we see this tremendous megatrend creating an opportunity for ADI in the range of $10 billion over the next 5 years.

Now let's talk a little bit about vehicles. The transition to electric vehicles is well past the tipping point. And in fact, it's shaping up to be the largest pivot in the history of the automotive industry. Over the next 5 years, we see the number of EVs on the road growing from 16 million today to over 125 million vehicles. And in this time frame, we see EV production per year will triple, while gas vehicles stay overall roughly flat.

Furthermore, because each electric vehicle contains approximately 3x the value of semiconductors compared to each gas vehicle, we see the total semiconductor opportunity becoming multiplied over time. This means that our customers are faced with several challenges. First, not only do the OEMs need to race ahead to continue to accelerate their EV fleets, but the vehicles must also provide the longest range possible to guarantee an excellent customer experience. Furthermore, there's a responsibility to guarantee that all of these batteries on the road can be recycled or reused, enabling a circular economy for batteries.

Now at ADI, our position in electrification is very strong and no matter how you look at it, we're the #1 in battery management systems. Our technology, called ADI Recharge, has the #1 market share position, having shipped in 10 million of the 16 million electric vehicles on the road today, equating to over 1 billion channels of BMS. We're on our Gen 6 product, and we're designed into 16 of the top 20 electric vehicle OEMs. Furthermore, the market for our product spans not only the electric vehicle OEMs, but goes into commercial vehicles, energy storage systems, as we explained earlier, and elsewhere.

From a technology standpoint, customers tell us that our chips are the best performing in the world, and we are committed to continuously raise the bar on performance. In fact, our products have the best accuracy in the industry, guaranteed over lifetime, and this enables up to 20% more miles per charge than the competition.

Now as we pivot over to wireless BMS, let's talk a little bit about what we have here. We are -- ADI is the first company in the world to have a production wireless BMS system. Wireless offers all the benefits of wired BMS, plus it saves wiring and it enables automated robotic manufacturing capability for electric vehicle fleets by enabling a modular battery design.

Developing this system was a significant effort, enabled by deep collaboration with our customers dating back several years. The approach that we took was to develop a completely new system from the ground up across multiple areas, extending from precision measurement, radio frequency, power, digital and software.

In total, the wireless BMS system is a complete ADI solution consisting of precision measurement chips connected to dozens of high-performance RF chips running ADI software, all inside the harsh environment of the automotive powertrain.

Furthermore, we designed security into every level of the system. And in fact, we just recently announced that our system is certified to the highest standard of automotive cybersecurity in the industry.

Taken together, we believe this is the most complex system-level product that our company has ever done. Also, as many of you know, in 2020, we announced that ADI was designed into the GM Ultium platform. Fast forward to today, and this system is now in production on the Electric Hummer EV vehicles, the Cadillac LYRIQ and BrightDrop delivery vehicles, with many more models to follow. It's the modular battery pack design, enabled by wireless BMS, which enables this fast ramp-up of the fleet, and we're honored to participate in these exciting new vehicles.

Now in addition to scalability and wire savings, there's another major benefit of wireless BMS and that's to enable a circular economy for batteries. So let me explain. As we look to the future, in the next 5 years, the 125 million electric vehicles on the road translates to about 10,000 gigawatt hours of batteries. To put this in perspective, this equates to approximately 3x the entire worldwide battery production capacity per year in that same time frame.

So the idea is to develop technology based on wireless that enables the battery health to follow its life cycle. And this approach has a number of benefits. For example, when the battery packs are assembled, the battery health data can be used to improve the sorting of weak cells versus strong ones. And there, the goal is to reduce recalls and warranty claims and to predict maintenance over time throughout the life of the vehicle and beyond.

Now at the end of the life, the health data can be used to determine which cells could be reused for energy storage or sent off to recycling. So these types of insights are giving additional benefit across the entire ecosystem. This type of economy is already available and supported today. And as we look to the future, we see the need only continuing to increase. Not only is this approach sustainable, but we also see it as good business for our customers as well.

Now let me switch gears and talk about another secular tailwind for ADI, and this is about automotive experience. Now as we've all noticed, our cars are becoming more and more sophisticated year-by-year. While full self-driving continues to be pursued by many companies, there are other applications which are here today and are becoming mainstream. A number of these applications relate to our experience inside the vehicle. In fact, we as consumers wish to have the same immersive, connected and personalized experience that we enjoy elsewhere in our lives to be replicated when we go into the car.

For example, voice is becoming our preferred way of interacting with the vehicle. And this trend drives towards an increased number of microphones and speakers and so on, plus an increased amount of processing to be used inside the vehicle. Another example is ADI's active road noise cancellation system, and this reduces driver fatigue and enables a unique and powerful audio experience to be joyed inside the car.

Now over the next 5 years, we see all of these applications driving an increased growth by factors of anywhere from 2 to 3x on HD cameras, microphone speakers, processing power and so on from where we are today. So overall, it provides a very strong opportunity for growth for the company.

Furthermore, these applications are giving rise to a new type of car architecture based on physical zones that use distributed processing and reduces wires and complexity from today's domain-based architecture, as you can see on the slide. Now today, ADI is the only and leading supplier of a comprehensive portfolio that spans from full audio, including processing connectivity to sensor data at the edge with our E2B solution, out to high-speed video connectivity called GMSL. All these solutions are highly optimized for the application to save wires and weight while outperforming the competition and leading this shift into zonal architectures.

In premium audio, ADI is the market share leader, and our digital platform is based on our flagship SHARC processor that offers real-time performance plus our unique A2B connectivity that provides the highest quality audio signals. As of today, we've shipped more than 100 million audio processors, and we have more than 60 million A2B nodes on the road. Furthermore, ADI is also investing in software IP to run on these platforms, providing application level differentiation for our customers and supporting and growing ecosystem.

In fact, 2 years ago, we launched the world's first all-digital road noise cancellation system with Hyundai, enables a unique bundling of technologies to a full system solution, and it includes software. Now going forward, we see this application becoming mainstream, especially on electric vehicles, where there's no engine noise and the customer feedback has been tremendously positive. Since launching the system just 2 years ago, we have 9 design wins, including 4 electric vehicle platforms with many more coming.

In video, ADI has inherited from Maxim, the world's leading solution for high-speed video connectivity with our GMSL product suite. These products operate up to 12 gigabits per second with unmatched power efficiency over a 2-wire connection, saving power consumption, wires and weight. Today, we've shipped over 500 million nodes to date to 12 of the top 20 OEMs. And we see this business growing very strongly as we look to the future as more data is passed around the car from high-definition cameras, sensors and displays. In fact, we see content per car increasing from 5 nodes in a typical entry-level vehicle to 10 to 15 nodes per vehicle for the higher ADAS.

And after this presentation, I invite you to take a look at the display outside next to the A2B display. It's an excellent example of showing what GMSL can do.

Lastly, I'd like to cover power management. Every node in the vehicle needs a power management function. And ADI is a major player, having shipped over 650 million units of automotive power per year. Furthermore, as we look to the future, we see an increasing number of functions in the car requiring safe operation. So let me just give an example. It's well known that cameras are a safety device, to provide the driver with information about objects or people that are located around the vehicle. However, cameras such as the rear backup camera also need a display and therefore, the display itself also needs functional safety to ensure that it operates reliably all the time.

In other words, you don't want your backup camera display to turn off when you put the car in reverse. To solve this challenge, we design our power components with functional safety from the -- built in from the very beginning. It's a complex design, requires special expertise and is a differentiator. Today, ADI is the technology leader for functionally safe power. And we've developed our unique semiconductor processes to enable the highest efficiency and lowest system built materials for our customers.

In summary, we've got a very exciting array of technologies for automotive, not only making an impact on the industry, but also making a positive impact on the planet. Our technology applies not only to gas and electric vehicles, but also extends to grid technologies, energy storage systems, charging stations and more. In particular, we see our battery technology enabling a circular economy for batteries that is not only sustainable but also recoups a massive resource of batteries on the road already. I look forward to showing you some more about our technology and the demonstrations as ADI stays ahead of what's possible in automotive. Thank you.

And with that, I'll pass it over to Mike.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

All right. Thank you, everyone. We have our first break. It's about 10 minutes. We'll meet at 10:15 out on the huge staircase out there with big TV for Q&A. Those who are doing dialing in or on the video online, there'll be a video and you can ask questions in the Q&A session. So for that, take a break, get some coffee and see you a bit.

[Break]

Unidentified Company Representative

Welcome back Michael Lucarelli.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

All right. Thank you for the entrance music. We'll start the Q&A now. We have about 25 minutes of Q&A. We'll have runners with microphones here in the crowd, raise your hand, a lot of hands being raised. Also online, please submit questions. I have a tablet. I'll try to get to as many questions as possible. And those who do our earnings calls know, that means like 5. Thanks so much.

QUESTIONS AND ANSWERS

Tore Egil Svanberg - *Stifel, Nicolaus & Company, Incorporated, Research Division - MD*

This is Tore Svanberg from Stifel. Mike, I'm allowed 2 questions, or 1 question?

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We'll let you 2.

Tore Egil Svanberg - *Stifel, Nicolaus & Company, Incorporated, Research Division - MD*

Okay. My first question is for Jen. When you talked about factory automation, and cross-selling with the ADI sensors, the Maxim connectivity and maybe even the Linear power. When do you displace somebody? And why would you not perhaps be able to cross-sell with those 3 competencies?

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

Are you asking kind of the -- how long it takes to design win to revenue in the industrial market. So we have a new bigger portfolio and how we can take that portfolio to the market and when that turns into cross-selling revenue, Tore?

Tore Egil Svanberg - *Stifel, Nicolaus & Company, Incorporated, Research Division - MD*

Correct.

Jennifer Lloyd

Yes. So I mean there are opportunities for additional cross-sell. We now have a bigger portfolio, right? Actually, I think a great example of that is in digital IO, where we have the Analog side, the digital side, we're bringing that together. It does take time. So we win those designs, it's going to take time for those to go into production and for us to see that revenue. So we do believe that with the bigger portfolio, there are opportunities to pull across to new customers for Maxim, basically.

Tore Egil Svanberg - *Stifel, Nicolaus & Company, Incorporated, Research Division - MD*

My second question was for Pat. So you talked about the systems business for medical. I was hoping you could talk a little bit about what that really entails? Because obviously, you've gone from selling components to subsystems now you're going to be offering perhaps more software. How does that work with your medical customers? Because I'm sure, increasingly, they would like to offer some of their own unique proprietary software. So where do you kind of draw the line there between working with them offering your software capabilities versus them offering their own software services?

Patrick O'Doherty - *Analog Devices, Inc. - SVP of Digital Healthcare*

Right. It's a good question, Tore. So right now, we're getting ready to launch our first product. Our strategy has been to focus on areas where our existing customers are not engaged. So we're going after white space that is truly white space for everybody. So there's no direct conflict in that respect. But surely, there is -- as a major supplier to all these equipment manufacturers, they're looking -- they will be looking at more complete offerings from ADI.

But our kind of journey up the stack has been one of kind of dealing with those as we went from components to subsystems to more complex subsystems, we're always kind of dealing with either a customer or a downstream equipment manufacturer who's looking at what we're doing as scans kind of like, why are you doing that? I don't see this as being any different. We'll manage it very carefully. I'm communicating what we're doing to our largest customers. So they're not all going to get a big surprise when we do launch our first product.

And in many cases, we may have collaborations with several of them because this is a new market for us. It's -- the go-to-market piece of it is probably the most novel for us, the technology piece as well and the clinical piece is well understood at this point. So we'll work through that, and we are already doing so. But it will remain to be seen how that plays out. I would say we have the experience of doing similar things up to now and it's worked out.

Christopher Caso - *Raymond James & Associates, Inc., Research Division - Research Analyst*

It's Chris Caso from Raymond James. So a question on the 5G market. And you spoke about doubling the SAM based on integrating and better penetrating macro and small cell. Can you speak about the share that you expect in that space and you're dominant in massive MIMO right now? Do you expect to have the same dominance as you move into -- move more broadly into macro and small cell, the timing for which some of those designs come into revenue and expand that SAM?

And then finally, on millimeter wave, which has kind of rolled out a bit slower than some had expected. At what point -- do you expect that to be a meaningful contributor? And at what point do you expect that to be the case?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. Thanks, Chris. So first, I should anchor that ADI actually has a very strong design position across all the form factors today, small cell, macro and a massive MIMO. So we have a very strong share today across all the form factors. And traditionally, though, we sold less digital integration to all of those, it was less dollars per channel. And I also -- so that's the first thing I'll say.

The second thing I'll say is that, that digital integration is been a journey. Our first solution with more digital integration was released in 2020. That's the digital front end, which had the linearization. We have customers in production with that solution today and have revenue from that solution already. And then our latest generation solution is coming to market. So it's an evolution. I think the way to think of that chart I showed is that it's an evolution for us from the left to the right, and we're kind of in the middle of that journey of the evolution. We have strong share in all those different use cases.

And I think the main takeaway is that this go-forward strategy increases the SAM and also balances our share as those different use cases evolve. So we see that as a benefit for the market and a benefit for ADI.

To the second question on millimeter wave, we also participate in millimeter wave. We have solutions in millimeter wave today. We're investing in millimeter wave. We're in the market. That market is still a smaller percentage. So the vast majority of the revenue today is still in what we call sub-6 gig. And so those 6 gig and below frequencies continue to be the volume of the market, but there is a millimeter wave on top.

Our view is that millimeter wave is going to continue to be important, but it's going to continue to be a smaller percent for some time to come. So I think that's the way we look at it. But we think it's important in the long run. We're investing in it. And there are use cases, obviously, for the customers where it has value.

Pradeep Ramani - *UBS Investment Bank, Research Division - Equity Research Analyst of Semiconductors*

This is Pradeep Ramani from UBS. I wanted to ask about your software sort of efforts and where you're seeing the biggest pull-through. I mean, it feels like health care and the wireless com side are sort of the obvious ones. But can you speak to sort of the software as a differentiator in maybe autos or some of the less obvious parts of your industrial business?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Do you want to start? Patrick, do you want to start?

Patrick Morgan

Yes, I'll start. So we talked about some of the trends on the -- let me cover the experience side first. We talked about some of the trends with respect to voice. ADI has recently launched something called ADI LISTN. This is a software-based system approach for improved voice control in the car.

The other example I would give you is on the video side with our GMSL connectivity link, their software, software is playing a major role in being able to get that technology adopted easily and seamlessly into the vehicle architectures of the car. And that's part of our total connectivity suite.

On the electrification side, I mean, wireless BMS is a fantastic example because you're talking about measurement chips, pack monitor chips, RF chips, all running ADI software. And that ADI software connects that whole system together, it runs on dozens of processors, RF chips inside the environment of the vehicle and connects all of that into a wireless network that enables the pack design to be scalable. So again, that's a hardware -- complete hardware, software system solution.

And in terms of a footprint and innovation and growing, hiring software engineers is a major part of our plan going forward. And we've done a great job to attract the best and brightest there, and we'll continue to do so as we go ahead.

Jennifer Lloyd

So maybe I'll add to that for the automation business. I think there's a couple of areas. So I talked earlier about condition-based monitoring. That's an area where predictive AI, and we actually have some field deployed AI technology there can be helpful in the learnings, that's one. And then we're offering software solutions for, say, Ethernet motor control that our integrated hardware, software solutions.

William Stein - *Truist Securities, Inc., Research Division - MD*

Will Stein from Truist Securities. We've heard a lot about product integration this morning with various technologies that you've either acquired or developed internally and you certainly have a good capability in digital. But one area that we tend to see Analog companies pursue is the broader microcontroller market. I don't think Analog has a play there. Can you talk about your propensity to invest and target opportunities that are more digital-first in nature.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

Patrick or Greg, do you want to grab it first on digital side and integration of...

Gregory N. Henderson - *Analog Devices, Inc. - SVP of Automotive, Energy, Communications & Aerospace Group*

Yes, sure. So I think the way to think about what we do in digital software and ADI, it probably scales across all the businesses is that we're not offering a broad portfolio or standard product digital microcontrollers. But across all the segments you heard us talk about today, we have a large amount of digital processing, integrated microcontrollers and integrated software. So our strategy is focusing on the application specific places where we feel like we have value and differentiation.

And those can be very focused, like, for example, I talked about 5G wireless communications or Patrick talked about wireless BMS. But you heard Vince talk about today as well, this [Apollo] software-defined signal chain, which is kind of a broad market platform that has a lot of digital and software. It's in a very advanced technology node. So our strategy is that we're not providing as much that broad set, but more focused. And that said, we do have a portfolio that comes from Maxim, which has micros and a big focus on security and maybe Jen or Karim wants to talk about that a little bit.

Jennifer Lloyd

Yes. So Maxim did bring to us a very low-power microcontroller technology, and we're looking at how we leverage that along with our signal chain. And I think we'll be able to find really good edge applications for that technology.

Patrick Morgan

Yes. The only thing I'd add from an automotive standpoint is that the way to think about our strategy is we come at it from the Analog perspective, integrating towards the center. So in the case of wireless BMS, starting with Analog measurement chips going out to the digital and then, of course, then moving up to the RF and then the software that runs on all of that, along the way, you pass through digital.

So what that does is it allows us to integrate the proper functions in the way that's going to be best for the system as opposed to going inside out, where you might say, well, I have this processor, this microcontroller and I need to put stuff around it. In the case of automotive, we've come at it from the Analog side.

Vivek Arya - *BofA Securities, Research Division - MD in Equity Research & Research Analyst*

Vivek Arya from Bank of America Securities. My question is actually for the industrial segment, so Karim or Jen or Pat. How cyclical have your businesses been in the last few years? Did you get any extraordinary benefit because of COVID, that might dissipate that we should keep in mind? And then what are you doing operationally to make sure you're shipping to demand? And I ask that, right, just because you have such a dispersed customer base. And when we saw some of the growth rates, right, which is obviously part of your business growing 15% to 20%, and they are far in excess of how we think about industrial businesses. So just a quick look back on cyclicality and how we should think about growth going forward?

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

Karim, do you want to start with that because I think you had some different benefits doing over the other markets?

Karim Hamed

Yes. So Vivek, thanks for the question. So as I highlighted in my presentation, the business, even though it's industrial and broad, but it's really aligned with all the secular trends, right? Especially for instrumentation, when you think about like these applications need to be tested, so we benefit from that. So that's the cyclicality that you usually see now spread across all these applications. So it helps us a little bit like whether this cyclicality auto, we haven't -- so that's the question what's going to them. It's very broad, it's very diverse, cover a lot of applications, along with secular trends, that help us weather the cyclicality.

In terms of supply, you are right. As I highlighted in my presentation, when we sell, it's hundreds -- and tens and hundreds of products we sell for a specific type of application. So I think our ability to be able to supply this high performance relatively high mix. That's our differentiation. Again, a lot of our products in the industrial are unique, differentiating technology, that's ADI proprietary. So I would say that's -- it's not like -- that's our key differentiation. We have a lot of -- and Vivek, we'll speak about it in the afternoon about our hybrid model. Some of this stuff is -- yes, we rely on external foundries, but some of our critical technology in industrial also internal foundries.

We work -- we have a symbiotic relationship with these customers for the longest time, like we've been supplying products. Actually, we supply them product, and then we'll turn around and use their equipment, right? So we're really joined them to happen, we really try to manage the supply across all these customers and regions. So that's at the high level in terms of how we manage it in terms of industrial. I'm not sure.

Vivek Arya - *BofA Securities, Research Division - MD in Equity Research & Research Analyst*

Pat, I think you could ask some good stuff on there about COVID and kind of impacting your business given our health care?

Patrick O'Doherty - *Analog Devices, Inc. - SVP of Digital Healthcare*

So as you might imagine, our health care business was the most impacted as soon as the pandemic hit. So we made supply of front-end patient monitoring and support equipment, our #1 priority across the company. So we placed it above everything else. And so there was a big impact from that. It was quite short. It was really the first 1.5 years, I would say. I guess that wasn't short.

And it was a very stressful period, but it was one where we were able to get to know our largest customers even better than we had before. So we had a parade of CEOs on calls constantly looking for products. Because the challenge and the ventilator system, we would supply up to 30 products. And so the ventilator doesn't ship unless we ship all 30 of those products.

And so you can imagine the stress that put on our systems and our fabs and making sure that we were shipping everything that was required in order to do that. So it did certainly give us a cyclical bump. It was rather shortened duration for the last year or so that has used off a lot, and hopefully, it doesn't come back again for that reason anyway.

Gary Wade Mobley - *Wells Fargo Securities, LLC, Research Division - Senior Analyst*

Gary Mobley at Wells Fargo Securities. I had a couple of other questions for Patrick. On one of your slides, during your presentation, you showed about half of your revenue growing at a 20%-plus rate. But I'm curious to get a little more detailed perspective on whether or not you can grow at an automotive chip market growth rate or above it?

And I wouldn't normally ask somebody about a competitor, but you came from one of your competitors in the BMS side. So I'm curious to get your perspective on architecturally how you differentiate versus one of your challenges in that marketplace, whether that be from the perspective of dedicated EV platform or however you want to delineate it?

Patrick Morgan

Sure. So let's take growth first. So there's 2 ways to think about our automotive business. Let's talk about the electrification side, electric vehicle production, tripling over the next 5 years, factor of 8 in terms of number of electric vehicles on the road. Obviously, that's driving -- that's driving -- that's a major mega trend that's driving our business. You should also think about ADI that we also provide content and systems on the other side of the plug, so around the grid and around that. So that's part of the way that we look at that particular business. So that's certainly a major mega trend that's obviously far outstripping the overall automotive growth.

The other way to look at it is on the experience that I talked about, the road noise cancellation, the connectivity, video connectivity, data being passed all around the car. That's a secular trend that continues on both electric vehicles and on regular light vehicles. And that tends to be more correlated towards the premium segment of automotive. And what happens is, over time, these features appear in the premium segment and they become mainstream. So what that means is that over time, that part of the business outgrows the overall automotive market, even in a kind of flattish or sort of slowly increasing. So those are the 2 sides of the business.

For your topic about architectures and differentiation, I'll talk a lot about ADI. And obviously, what we do here is we focus on systems. We focus on solving challenging problems. We start from the Analog and we work our way back towards the center. And we deeply partner with our customers to make sure that the solutions that we're developing are relevant. We don't just want to develop technology for the sake of technology, but we want to develop technology for the sake of solving a planetary scale or an experience type scale problem. And so that's really where we focus.

And some of the technologies that we've talked about that we've highlighted, video connectivity, battery management. These are really difficult problems to solve. They require precision analog. They require processing and algorithms. Even voice control with the car, it's a very difficult thing to get right.

And maybe after the session, we can also take a listen at the -- some of the vehicles that are outside the -- the Dolby Atmos, which is in the Tesla Model X out there is just it's an amazing experience that you got to see for yourself.

Gary Wade Mobley - *Wells Fargo Securities, LLC, Research Division - Senior Analyst*

Patrick, one comment about our competitor and us. We both are at #1. How is that possible?

Patrick Morgan

Right. So in the case of Analog Devices, what we say that we're #1 in is in battery management systems. And what that means for us are high-voltage battery cell monitors, pack monitors and then the software that goes along with that. As was mentioned earlier, we don't currently go after a broad distributed portfolio of microcontrollers that are all over the car, for example.

So that would be one difference between some of the other competitors and where we play. We're mainly focus on the analog side, on those analog problems, of course, with digital and software in the case of wireless, but we don't have a large broad-based microcontroller portfolio.

Gary Wade Mobley - *Wells Fargo Securities, LLC, Research Division - Senior Analyst*

Anyone with microcontroller?

Patrick Morgan

Yes. We deliberately architected the system that way.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

And then, Gary, your other question about growth and market growth. In Prashanth's section towards the end of the morning, he will talk about each market and the growth by each market for X Models and also looking at our business at an enterprise level from a growth and franchise standpoint.

William Danoff - *Fidelity Investments Canada ULC - Portfolio Manager*

Will Danoff from Fidelity. I'm curious how your executives work with each other, either sharing ideas about technology and maybe customer relations? And then secondly, Greg, I saw your slide had a mention of China Mobile. I'm curious how Analog is well positioned in China, both for your business as well as the other executives businesses?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes, sure. So maybe I'll start with both questions. First, I've had the opportunity to operate to work at a number of different companies. So I've gotten to see a number of different cultures. And Analog Devices has a great collaborative culture. So I know it's kind of cliche but the stories you hear about really being innovation-based and trying to solve our customer problems is real for Analog Devices. And you'll probably hear that from others around the day, people that come from other companies may tell you the same thing.

So we have a very strong kind of gene in collaboration and technology. We're organized into market-facing businesses. But we also leverage our technology outside of our market-facing business. So for example, if one of the market-facing businesses needs technology, that's in a different business unit. In my case, for example, I have a business unit focused on wireless communications. I had a second business unit focused on aerospace and defense, 2 different leaders and -- but they collaborate if the technology needs to cross and that's true across the businesses. So I would say that's first.

Secondly, we have a strong position in China broadly, I would say. Clearly, there is that situation we have with wireless communication, where we have some customers that we're not able to sell to anymore. And so some of that market has -- is no longer available to us in wireless. But I will say that we still sell our technology in China in the wireless market.

Customers still value our technology. We have a very good solution. And across the other markets and the other leaders can speak to that as well. In wireless and the other markets, we will -- are in China, and we'll continue to see growth there trying to come. I know Patrick and Pat or anybody want to add to that?

Patrick Morgan

Yes. I mean I've got a good example. Our Ethernet to the edge solution that we've announced called E2B, it actually was developed with our industrial colleagues. In fact, you can see the demonstration that's up there, and we can talk more about that later. But there's a certain type of standard that was perfectly suited to where we saw the automotive megatrend going for passing sensor data around the car. So we developed our Ethernet to the edge solution. We collaborated with our industrial colleagues and we made it fully automotive compliant. And I think that's a great example.

And we have lots of examples across the company of parts that our customers are interested in that, that they'd like to apply to an automotive application. And that's where my group jumps in and works across the company and make sure that we get the customers what they need, the parts they want to make sure it's perfectly suited for automotive. So there's a lot of examples, but Ethernet, that's one nice example, I think.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We have time for one more question before we break.

Harsh V. Kumar - *Piper Sandler & Co., Research Division - MD & Senior Research Analyst*

Harsh Kumar, Piper. Two quick questions on Automotive. You guys seem to be doing really well with BMS and a lot of focus on in-cabin sort of effort going forward. But one thing that you guys seem to be missing is charging, I'd be curious on your thoughts on that area? And then secondly, I think you mentioned that the wireless BMS system was developed in conjunction with the customers. So I'd be curious if you're limited to that customer? Or can you pursue other customers outside of the one that you have?

Patrick Morgan

Sure. Yes, let me take the first one -- the second one first. So no, we are not limited. We have other customers. We just haven't announced that, but we're looking forward to being able to share those with you as we go forward. And the other thing I'll say is that we see a lot of interest for the value proposition that wireless BMS brings. It's a scale and it's wire savings, and it's the battery, what you can do with wireless that you can't do with wired. And those are really major value propositions that are of high interest for a lot of our customers. And sorry, what was the first part of your...

Unidentified Company Representative

Charging.

Patrick Morgan

Charging, sorry. Yes. So we didn't talk too much about vehicle charging, but we do have a solution for vehicle charging. We've also got solutions for a number of other parts of the vehicle. But it wasn't a focus point today, but we do have a strategy in place. We have products that we sell in today through our customers, and we have revenue today for that function.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

Patrick being a little bashful. We actually have multiple customers design wins. Lotus is one in wireless BMS. We also have another large, I think, European that we can't name, but we're doing well. So it's not just GM, it's many there.

Patrick Morgan

Yes.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

And with that, we are over time by a minute. We'll take a 30-minute break. Those online, do what you want to do. People here in the room, the demos are open. There are snacks up there on the second floor, take 30 minutes. The one -- I'll point out that A2B and GMSLs in this corner. They're great demos. So I encourage you to go to the back. And health care is over there in that corner. Thank you, everyone.

[Break]

All right. Welcome back after Q&A and snacks. We have 3 more presentations to go through. We have Anelise, our Chief Customer Officer; Vivek Jain, Head of Manufacturing; and then we'll end with Prashanth unveil the new long-term model. So get your Excel spreadsheets ready. And with that, Anelise, the floor is yours.

Anelise Sacks - *Analog Devices, Inc. - Senior VP & Chief Customer Officer*

Hello. Good morning. My name is Anelise Sacks. I'm ADI's Chief Customer Officer. It's a pleasure to be here with you today as well as online. As for my title, customers are my biggest priority. And with that, my biggest financial priority is profitable growth. And today, I'm excited to share how we're going to accelerate that growth curve. So what are the differentiators at the core of ADI's growth stories? How we are at a turning point in our go-to-market strategies and how revenue synergies are going to be adding momentum to the transformation.

So here's a picture about our growth story. As you know, we've been growing at mid-single digits because of our strong foundation. We are an analog powerhouse with the best innovation in the market. And we've been leveraging this harder than before. So we have a stronger-than-ever opportunity pipeline with 80% of this pipeline being comprised of products already released. On top of that foundation, we have distribution optimization, where we have renegotiated our terms and also changed our model to be growth outcome based.

We also have successful value capture, where we were able to pass the inflation costs to our customers, as well as the excitement you heard this morning with the R&D pipeline that we have. Today, I'm going to focus on these bold growth drivers, which are exponential growth drivers. We are very serious about scaling our human, which means our direct field as well as our digital go-to-market strategies. We are also changing the way we go-to-market with our products by co-creating system and solutions with customers that reduce the friction of our value delivery to them.

And we have a huge advantage because we bought Maxim, and it's going to add revenue synergies, which is the piece I'm going to go deeper today. So it is a very exciting time to be in ADI at this point in time. So let me summarize what we are about. ADI is a trusted partner that co-creates with customers, big and small. Let me explain how it works. So we have the main advantages of domain knowledge, which allows us to innovate as well as the customer intimacy, the strength of our customers' relationships. And these concepts are mutually reinforcing.

The more we solve the toughest problems for our customers, the more customers rely on us, the more we learn and the more we are able to solve the toughest problems. Even when we are just selling components, that trusted relationship is really what makes the difference for us. I joined Vince's team about a year ago, but I've been in the industry for about 2 decades, and I can say that this opportunity is unique. And it's not only the Customer Office, which is focused on customers, but it's really the whole company that is focused on customer success. So now we are actually leveraging that capability and taking it to the next level with personal, trustworthy and reliable treatment more broadly for more customers.

So with that, we also help humanity improve with the use of our technology. How are we doing that? We are expanding our customer-facing teams. So account managers, our world-class field application engineers, sales operations, the whole team that is directly accountable for customer success. In fact, with the Maxim acquisition, we are growing that by 50%. Also, customers are relying on us to help them strategically, not only in terms of supply, but also how they win and compete on their markets. Therefore, we are deepening as well our relationships at the top, and you're going to have the chance to talk to some of the executives of our customers today.

From a distant perspective, it's all about optionality, basically meeting the customers where they want. So we have streamlined our engagement and with them, and now we are outcome-based, incentivized for growth. In digital, we are already and we will continue to improve to be the best place for customers to find, choose, evaluate, get support. Today, our customer today our toughest problems. So here on the digital side, we are enabling more customers to experience that customer success. And we're also enabling our field to be more efficient because of the use of digital technologies.

You can experience a little bit of that customer intimacy by visiting our customer demos this afternoon. They came from many places around the world to show you the fruits of our partnership. So switching gears to revenue synergies, which a lot of you asked me yesterday night. Here, we have a clear path to realize revenue synergies. We divided in 3 buckets. The first one is customers. Customer synergies are the fastest one to actually bring up revenue from all of the 3. This means we are directly leveraging our relationships to pull the extended portfolio. I tell you this is already happening because our customers are really hungry to grow our engagement.

And now that we have a bigger portfolio that can pull that immediately. The second one is product related. As I mentioned before, we are an analog powerhouse, the only ones that can do microwave to bits, nanowatts to kilowatts, sensor to cloud. And with that, we can leverage our anchor product positions to pull the breadth of our portfolio in an accelerated cross-sell, solving for innovation complexity and reinforcing the cycle that I talked about on the previous slide. From a timing perspective, there is an immediate uplift as well as a lot of co-development and co-creation going forward.

The third one is going to be beautiful. So we decided to call out power separately because it is such a great opportunity. We have been long underrepresented given the leadership we already have in signal chain. LTC definitely helped us to dominate the high-performance market. And now with Maxim, we can actually go to the mid-level performance of that market. So we have some that we can do immediately, but also planting many seeds to come out with revolutionary innovative solutions, which is what we do best, in a couple of years.

The next 3 slides I'm going to present 3 examples so that you can picture better the opportunity on each one of them. From a customer synergy, I chose (inaudible). Here, Maxim has the best-in-class technology solution for this area. ADI has a very strong relationship with global car manufacturers as well as Tier 1s. We also have the domain knowledge, the software, the DSP experience and the courage to invest.

With that, we have 9 out of 10 OEMs already with our audio technology, which is the A2B technology. While in GMSL, you can see it's only 4 out of 10. So you can see that instantly, we can leverage our strengths. This bucket alone should bring us at least $200 million within 5 years, because the game has already started on day 1 last year. Another point that makes me very confident about this is because the organizations have to do it. So if you actually look at our BMS that we acquired from LTC, it grew 3x from 2017 to 2021, not to mention the extremely strong pipeline that we have on this product.

Now I'm going to talk about portfolio synergy. This is a very important market that we have industrial automation process control. It's all about driving intelligence, control and connectivity at the edge. ADI has cutting-edge analog and Ethernet on this area as well as sensing and system capabilities. We are the market leader on industrial with a broad customer base.

Maxim has strong low-power digital AI and security portfolio as well as actuation capabilities. The result, at least $100 million in 5 years where we'll be solving for design complexity with full analog, digital and software solutions, giving customers flexibility and faster time to market while also making our solutions sticky. Not to mention everything that we are learning for future integration.

The final synergy I want to address today is power because this is a significant opportunity expansion. The combination of ADI and LTC in 2017 enabled us to dominate the high performance end of the market. Now adding Maxim will help us expand to the mid-level performance of the market, therefore, adding about $3 billion to $4 billion of SAM. Now we can deliver smaller, higher performance power, do it faster without any erosion of margin. We also have integration capabilities that are second to none as pictured here on the data center micro module. This will enable us to double our power revenue in about 5 to 7 years as you have been hearing from Vince on earnings calls.

The whole organization is very energized about this, and we believe that we will be able to maintain that growth long term with at least 10% CAGR. So that we can better balance our signal chain leadership with power leadership as well. I hope these 3 examples begin to give you a sense of the incredible potential we have in front of us. And why we feel confident on our long-term growth model of 7% to 10%. We have developed core competency on acquiring great companies and expect Maxim to do even better because of the complementary strengths and power opportunity.

We are also fully leveraging our larger, highly skilled and experienced field team being augmented with transformative, hybrid and digital go-to-market capabilities. Finally, we also have a lot of discipline, metrics and systems in place to ensure that we accelerate time to revenue as fast as possible. With that, I'll close by saying that this is a once-in-a-lifetime opportunity to be where we are at this point in time. And I couldn't be more excited about the profitable growth that we will achieve together.

Now I'd like to present to you the person who's going to build for that growth, Vivek Jain.

Vivek Jain - *Analog Devices, Inc. - SVP of Global Operations & Technology*

Thank you, Anelise. Good afternoon. Well, you heard exciting stories from business unit and analysis about our growth. And they're all counting on me and my team to bring this growth to reality. So -- Well, I came to ADI through acquisition of Maxim, and I've been here on the seat for about 8 months, pretty hot seat. But has been really exciting to be part of ADI. Before I tell you a little bit more about what we want to talk about on manufacturing strategy, let me tell you a little bit about myself.

I've been in the semiconductor industry developing and high-volume manufacturing technologies for the last 38 years. And over the last 28 years, I covered the entire spectrum of technologies. So 14 years, I spend at Intel developing deep submicron technologies for microprocessors and flash technologies, developing them and putting them in high-volume manufacturing. And then I came to Maxim Integrated, where we worked on more than more, connecting the real world to the digital world. And during this time, really transformed manufacturing model at Maxim to go from completely internal manufacturing to a hybrid model and actually gained about 500 to 600 basis points of gross margins.

So I think coming to ADI, this is a really exciting time to be at ADI. And there are 2 things which really excite me. One is really, the customer intimacy. And to talk about customer intimacy, in the first 14 weeks here at ADI, I met more customers than I did at 14 years at Maxim. The second part about customer intimacy is really understanding customers' problem and how to solve them. And when we talk about going up the stack, you see really living and breathing out here at ADI.

So I see manufacturing has a huge role to play in providing customer solutions as well as making a very hybrid and resilient supply chain to win customer trust. Okay, so let me tell you about our growth strategy for the coming years. So on the left side, you see some numbers. This is really talking about vastness of our manufacturing network. So you've got about 20 external partners, 50 sites is spread across 10 countries. And the 15,000 employees across the world, delivering products to our customers. On the right side, you really see hybrid manufacturing and advantages of hybrid manufacturing. The one really big advantage is the fact that you can use best of both worlds, what foundry partners provide the technology we can use them. And then the technology which they don't have, and we still need to develop to meet our customer needs, we develop them internally.

So you get best of both worlds. And the other advantages of hybrid manufacturing is it's very responsive, it's diverse across the geographies. It's capital efficient and provides very resilient to our operating model. And I'm going to talk about different aspects of it over the coming pages. So this is just a graphical representation of technologies, which is best of both worlds. So what you see on the right side is technology we can get from our foundry partner network. And if they've invested in developing those technologies, we want to leverage their investment in using this technology for solving customer problems.

And then as you're working intimately with customers, there are solutions we need to make, which has to come from our proprietary technologies that ADI has to develop. So we complement those 2 things to really meet a vast array of customer needs. So I think that's really the critical advantage of this hybrid model is best of both worlds. And this covers for 7-micron to 7 nanometers worth of technologies, okay? And this applies to assembly as well as test.

Now this is a very important page. I think this is -- really has got the crux of why hybrid manufacturing is so critical and why so important. So you see this world map. It's showing wafer fabs, which are providing products for ADI, and they are spread out across the whole world. Then you see a bunch of arrows. This is talking about one particular technology node. It's a 180-nanometer technology node, which is a proprietary technology, which came from legacy Maxim. And it is showing that it is running in 4 different factories, 1 in Japan, 1 in Taiwan and 2 here in U.S., Texas and Beaverton.

And the trick out here is that analog technologies require 300 parameters we matched. So to make this resilient hybrid manufacturing work, it requires detail to make sure that you can match this process to the level of detail that you can shift processes and products across these factories seamlessly. This is the hardest part. And that's what makes this hybrid manufacturing model very resilient, okay? That's where people stumble. And that's what we have done it, and that's the reason -- it's obvious once you can do it, that you want to invest in hybrid manufacturing model.

So here is our investment model on the left. We were investing about 4% of revenue in capital investment. Over the coming couple of years, we will be investing in high single digits, and we'll gradually tail it down to the mid-single digit. What does it get us? Look at the middle of it. With this investment, we are doubling the capacity of our internal factories. And that's the fastest way to actually meet customer needs. Because when you expand existing footprint, that technology is already qualified. You put additional tool as the capacity comes online, customers accept it right away. This is the fastest way to meet customer needs.

And then we are investing with partners to really enable the technologies and capacity with -- still investing in capacity for certain nodes. So that investment would help us enable this flexibility of a manufacturing model, where today, about 25% of our process flows can flex between sites that grew from 25% to over 70%. That's a critical part of this resilient hybrid manufacturing. And obviously, it's capital efficient and provides higher return on investment. That's the reason Prashant is going to approve this capital investment.

Now I want to talk about one more very important aspect. That's about why does it provide resilience, financial resilience. It's showing you pictures on the left and the right, left is like internal factory. Right is like external foundry. Our own factories are little bit small. They're not as big as a foundry network. Our foundry is about 10 times bigger than our internal factory. And you can think about when you make this resilient model, there are more than one foundry factory running a given technology node. So if you think about a 10% swing in demand, we can grow our own factory by about 10%. Or actually, we can have my part -- foundry partners flex their capacity by 1% to meet the demand of surge.

It similarly works on the downside also. Our 10% demand drop actually really resulted in less than a 1% absorption in the founding network, and it still keeps our factories well loaded. That's a critical part of providing resilience to a financial model. Now I'm going to switch gears and talk about proprietary technologies for solving our customer problems. So this is a technology. It's a drill that ADI acquired through acquisition of Maxim. It's a power technology at 90-nanometer node.

What you see on the left side is just showing that what was done in the previous generation, you can add more features through the technology, reduce the die size by about 25% on this 90-nanometer node. It's on 300 millimeter. And not 1 factory, but 2 factories. Geographical diversity in Taiwan and in Japan already functions, it provides a low cost and flexibility. But the charm of this technology is look at the right. It's about -- it's a platform technology, means this technology can meet needs from 2 volts to 80 volts.

It can meet needs for consumer, data center, industrial and automotive. And the charm is that if you build a design IP on any one of these nodes, you can leverage that design IP for making the next product seamlessly. So that's why this power platform is going to supercharge ADI offering as they unleash engineers on this technology. And that's really going to help us take lead position in power product portfolio. I want to talk about packaging. I mean, packaging is a critical aspect of going up the stack. So oftentimes, you cannot just provide solution for meeting customer needs in a single die. You have to put multiple dies to provide different features and integrate them to meet customer needs.

Example on the top shows our micromodule. It's a signal chain board, which has been reduced by a factor of 11 per tiny micro module. It solves customer problem in a very efficient manner. Package on the bottom right, you see that Karim talked about for ATE equipment. There are 5 dies packed in the package, very power solution. It's a 3-dimensional package to meet customer needs in a very tight form factor. The left -- the bottom right shows a package for a very advanced technology that Greg talked about for transceivers. It's a 60-nanometer technology packaged in a very advanced package to provide that solution.

This is a critical competitive advantage that ADI provides for its customer in solving difficult problems. And this is very unique because I've seen many companies. Out here, the number of dies that we sell into the market with more than one die in a package is in double digits. For previous company, it was less than 1% of those kind of dies. So it's a real living, breathing action of providing going up the stack and providing solutions for the customer for meeting their needs. The last page I'm going to talk about is really a pillar and the foundation of manufacturing pyramid. That's environmental health and safety.

If I look at the safety record of our internal factories, they're better than the benchmark. We went through the entire pandemic with minimal disruption to our working workforce. And we are committed to having a long green planet and we're coming -- the green bars that you see are focused on 4 areas: controlling greenhouse gases, recycling water, reducing wastage and actually using renewable energies. And we're pretty much on target for delivering what we set up to deliver for 2025. Let me wrap it up. In summary, I've explained to you why this high-end model provides complemented technologies to solve difficult customer problems.

Investing on our internal factories for doubling the capacity is the fastest way to meet customer needs, investing into this hybrid model to really provide resilient model for financial resiliency and getting better utilization of the capital invested over the world, okay? Last but not least, it's really meeting our customer needs, having a resilient flexible supply chain is critical on winning customer trust for taking -- designing ADI products in their product portfolio. Thank you. Let me invite Prashant over. Thank you, Prashant, for coming over. He's my friend. He's going to give me the money to build out this manufacturing network.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Thank you, Vivek. Thank you for supporting us on Investor Day. Now you can put your bunny suit back on and get back on the line.

Vivek Jain - *Analog Devices, Inc. - SVP of Global Operations & Technology*

(inaudible) some customers.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Mike has been telling me for a couple of days now that there's going to be a lot of interest in the model that I'm going to present shortly. So after last night's guest, I thought, Mike, maybe you can just start calling me a little poppy. All right. So I'm here to wrap it up. Let's recap what you've heard today. You've heard from our BUs that innovation is core to what we do, and I hope you've also heard that we are market makers. We partner with our customers, and we create opportunities that didn't exist before.

You've heard from Anelise how intimate we are with our customers and how that intimacy builds a long trusted partnership that allows us to provide complex solutions and really move up the stack. And you've now heard from Vivek that manufacturing really is a competitive differentiation for us, both through our advanced packaging, the P90 process and our reliance on the hybrid manufacturing model to really support our gross

margins. I'm going to take you through 3 key elements. First is just a reminder of how durable and resilient this business is, introduce our new financial model for the next 5 years and then give you an update on how we're doing with our integration of Maxim.

So let me start with just that reflection of how important diversity is to ADI and how the barriers to entry from that diversification lead to this extraordinary financial model. It starts with the markets that we play in. And as Vince has pivoted this organization over the last several years to really focus on B2B, it's allowed us to put our emphasis on those secular trends that are going to continue to carry this business for the next several years. And I would argue maybe decades. Consumer continues to remain opportunistic to us and where we pursue opportunities in consumer, it is very accretive to our operating margins.

Geographically, we are well diversified feet on the street in all of these geographies, and then we amplify that through our use of distribution partners, which bring with that technology support, and that allows us to serve our customers globally, and it also allows us to serve our global customers locally. But the real highlight is our portfolio, built both organically and inorganically over several decades 75,000 SKUs incapable of being replicated and a few points to make there. That high fragmentation is what creates a very wide economic moat for us, first; second is that we still have a substantial portion, almost 50% of our revenue that's continuing to come from products where the R&D expense -- the R&D was expensed decades ago, very accretive to our model.

All of these together create those barriers to entry, which allow for us to provide a very attractive financial return. And just to recap what that looks like. Trailing 12-month gross margins up 71%, supported by operating margins 42% because of that CapEx-light model we're able to convert those margins into substantial free cash flow generation, putting us in the top 10% of the S&P 500, almost 2x to SOX. And free cash flow generation is critical to how, we as a leadership team think about this business. You can think of it really as our true North. As we make our portfolio decisions, it comes down to how do we think about that in terms of the free cash flow that those generate.

So a few comments I want to make here. First is this enterprise is much, much larger than it ever has been. And of course, with that, you would expect more free cash flow generation. But I want to highlight that while we have generated more free cash flow, we have also increased the free cash flow margins of this business as we've grown in scale. And the second, to that point of resiliency. Over 25 years, we have endured technology disruptions, economic cycles, a pandemic, a global trade war. And throughout that period, we've always been able to return a meaningful return of cash on our revenue.

So with that as backdrop, let's get into the financial model. Our prior model and our new model, I'm just going to walk through the shaded areas. It starts with the revenue growth. Vince has already debuted this, midpoint of 8.5%. I want to specifically reference that this is off of an FY '22 base. If you ran it off an FY '21 base, it's North of 10%. I'll talk more about how that comes together, but hopefully, you've got a sense of that from the morning's presentations. We continue to believe gross margins extraordinarily high, industry-leading.

We're setting a floor of 70%, and we expect to operate North of that as we are in the current environment. Combination of the synergies from Maxim, which I'll talk about later, and continued discipline in driving financial leverage will increase operating margin. You can see that we have a path that could get us to put a 5 handle on those operating margins. Vivek spoke about our CapEx commitment. Mid-single digits for CapEx intensity allows us to generate a substantial amount of cash, returning that to you. And we see a path to $15 of EPS as we approach that 40% free cash flow.

So I'll walk through some elements of these in the subsequent slides. But let me start with just some financial philosophy of how Vince thinks about the priorities for his team. It starts with the expectation that the businesses need to deliver above-market growth, and that's driven by the innovation that is funded by the innovation that we use in our R&D. We enhanced that with the gross margin leverage we get from that hybrid model that allows us to scale quickly in various environments, but maintain that profitability.

We add to that operating leverage, that financial leverage, partly through the Maxim synergies, but partly with the understanding across this organization that we have to grow revenues meaningfully faster than we grow our cost. And all of that comes together in cash that we return to you 100%. We are not changing that commitment. We believe doing that will drive long-term shareholder value. So revenue. You've heard a lot about revenue today, and I know there's been some questions about, hey, how does all this come together in the numbers you've heard at a high single digit?

So think about the overall revenue profile in this way. About 1/5 of our revenue is pointed towards high-growth applications that can grow in excess of 20%, and that is supported by the balance of the business, which is a core growth business that still grows sort of that GDP plus. You can see the end markets here. We've talked about many of these end markets, but we also have a number of subsegment markets that we have not addressed. And I want to clarify for any avoidance of doubt, that was purely in the interest of time.

We have a number of exciting additional stories we could have covered such as the high growth we have in cloud and data center, the incredible profitability that we get from our defense business, which is so important in today's environment to the national security of the U.S. and our allies. Our consumer business, which I've mentioned, and it was a great question during the Q&A is a terrific example of leveraging the R&D investments across the B2B portfolio to opportunistically drive growth in consumer.

And then, of course, our sustainable energy business, which we know will play such an important role as the world solves for net zero. You put these end markets together along with the high-growth applications that you've seen, and you can see how we get very comfortable with sustained ability to grow this business at high single digits. Profitability, a few comments to make. First, I've mentioned a real 70% floor for gross margins, again, industry-leading and a path that can take us for operating margins to include numbers starting with the 5. Two comments I want to make here: first, the blue and the purple represent our prior model, and I'm hoping we'll give you conviction that we take these commitments seriously. And you can see that both in -- of the '14 model and the '17 model, we've met our commitments.

And the second is, although it is a much larger company today, we have structurally improved the profitability of ADI, where our former peaks are our new troughs. That profitability comes from discipline and driving leverage. So my colleagues have talked to you through many of the value capture items already. I'm just going to double click on pricing for a minute. So as you think about pricing on a go-forward basis, here's what I'd like you to take away. The market dynamics continue to be very favorable for us, consolidation of the industry and really, as Vivek mentioned, sort of the tailing off of Moore's Law and the importance of us in providing solutions that are beyond Moore's Law.

And second, ADI-specific. One clear takeaway from this morning is we are providing solutions. And all else being equal, those solutions come with higher ASPs because they embed in all of our proprietary IP and domain knowledge. And then in addition to that, we're clearly going to be passing along cost increases that we face through this inflationary environment.

So as we look out, we would guide you to think about pricing as flat-ish compared to historically being a little bit more of single-digit headwind. Okay, Maxim synergies. When we closed the deal or when we announced the deal, we said we were going after $275 million. So let me update you what has happened since then.

We're increasing the total target to $400 million. We expect to exit fiscal '22 with $275 million. That will be about half cost of goods and half OpEx. The incremental $125 million will be in the run rate as we exit fiscal '23, that will be a little bit more cost of goods heavy. In addition, Anelise has now put out our number on revenue synergies, $1 billion plus. I would encourage you to lean in on the plus that certainly where Vince is leaning in on her. That starts in 2024, takes time to ramp. It comes originally with the cross-selling opportunities, and she's highlighted 2 of those as well in the industrial and GMSL.

And then it goes into the co-design of products. What I'll say here is we know how to do this. We've learned from Hittite. We've learned from LTC. We know how to grow these businesses using the leverage that comes by going across our enterprise. So in the end, perhaps the most important decision of the C-suite is around capital allocation. And we're not changing our approach here. This is about giving 100% cash flow back to our owners. Walking you through the pieces. Dividends remain the cornerstone of our capital allocation policy. Whether you look at it over the past 4 years, over the past 10 years, ADI has grown its dividend at a 10% CAGR.

As we look forward, we feel good that supported by high single-digit revenue growth on the top line, we should be able to continue to grow that dividend 10% through the cycle. The remainder of that cash comes back through repo. We had targeted an additional $2.5 billion of repo by the end of the calendar year. I feel pretty good that the rate that that's going, it will probably be by the end of the fiscal. And then there's another $5 billion that comes in on top of that in the subsequent quarters. We're very comfortable with our debt profile, well below our target leverage. So as we move forward, expect us to continue rolling that debt forward versus paying it down.

I will say that we are evaluating and very like to add some marginal leverage this year to support some of the capital expenditures that Vivek just talked about. And our philosophy there is, given today's rate environment, if we can add a little bit of leverage and allow us to continue that rate of cash return for you, so you are not disrupted by the higher CapEx spending we have in this interim period. That's a trade you're willing to make. So to close, our investment thesis. If we can offer you a $12 billion franchise with a very durable and sustainable revenue stream, that is growing at high single digits with industry-leading margins, we can support that growth with a very modest investment in capital expenditures, generate meaningful cash flow off that and return all that cash flow to you. That should be a very investable company.

And with that, I'm going to hand over to our CEO and Chair to close.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Thanks, Prashanth. So let me take you home. It's been quite a fast relay we've run here today. So once again, I'd like to thank you for your time, your attention and your endurance in sticking with us today. We've covered an enormous amount of material. And I hope we've left you with a deeper sense for not only the heritage of the company, but how we're bringing that heritage into the future with us and how we continuously transform this company to add increasing value to our customers and society.

So in closing, I'd like to leave you with 3 takeaways: number one, we've built the world's premier diverse, extremely durable franchise through a combination of innovation, organization-wide customer focus and investments, as Prashanth said, that are focused on the most attractive opportunities in the entire world of ICT. Secondly, ADI's long-term vision and strategy have guided our investments in portfolio as well as talent, positioning us to accelerate our revenue growth as markets increasingly move towards ADI's technologies, as I think you've heard amplified during the various presentations today; and we're delivering an industry-leading financial model, as Prashanth you said, that delivers solid consistent capital returns that we believe will continue to increase over the quarters and the years to come.

So with that, I'm going to hand you over to Mike, who will see the next part of the show here. Thank you.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

All right. We are done in this room here. Going to our second Q&A out on the big stairs again. Vince and Prashant up there for 30 minutes. Feel free to ask questions online. Shoot over questions. We got none last time. I will ask your question if you put it in, maybe. Thank you so much for coming.

(Break)

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We're good. There we go. We're on now, mic check. Last 30 minutes, Q&A. Vince and Prashanth for 30 minutes, fire away the Q&A, and then we'll go to lunch and customer demos. Thank you, everyone, again, for coming and attending and those online.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

While we're waiting for the first question, let me maybe just make one comment here. We know there's a lot of interest in the macro environment. So we're happy to take questions on that as it's important to you. But I want to emphasize, we are not updating our guide here. So we'd like to stay away from second quarter. I will make just one comment on the quarter for those who are following at that level.

From a revenue standpoint, we are expecting to come in at the high end of the revenue guide. My head of FP&A says we might even tip over the high-end, but that's the only quarterly comment you're going to hear from us today.

Harsh V. Kumar - *Piper Sandler & Co., Research Division - MD & Senior Research Analyst*

Yes. This is Harsh, Piper. Prashanth, question for you. You talked about 7% to 10% growth rate, and you also talked about $1 billion worth of synergies starting 2024, '25 -- '24 to '25. So help me square the growth rate then -- at the rate you're at, you will get to the low end just from synergies alone. So how should I think about your organic growth rate?

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. So Harsh, just as a reminder that, that revenue growth rate comes in over time, right, as we've seen with Linear and Hittite. It does take us time to ramp that in. So expect that to begin in 2024, continue to ramp over some period of time. And then as we exit, we'll have the full $1 billion in the run rate. So I wouldn't look for that to drop in, in a slug in the near term.

Tore Egil Svanberg - *Stifel, Nicolaus & Company, Incorporated, Research Division - MD*

Yes. Tore Svanberg, Stifel. Thank you again for putting this together, really informative. I had 2 questions, if you don't mind. The first question is a clarification on the internal capacity. You said you would double it, which -- based on my calculation is about $10 billion of internal capacity. Over what time period is that? That's my first question. Second question is for both of you.

You believe pricing is going to be flattish going forward. Obviously, you're not going to put a time line on that. But just philosophically for both of you, don't you think that maybe pricing is going to continue to move higher even after this sort of supply chain mess that we've had?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. Well, maybe I'll take the second question first, Tore. So there's really 2 ways to think about pricing. The first is, if you take a transactional view, right? We've -- I think, in the industry, and certainly at ADI, we've been in the post-Moore's Law era. We're giving less prices away every year. I think customers care far more about getting supply, getting access to our quality products over the long term.

But I think the part of our story, the strategic part is about getting more and more ASP for the products that we're developing by adding more and more value with each generation. And if you track ADI's record over the last several years, that's been happening. I mean we've been -- I think we've probably doubled in the last 10 years, ADI's ASPs.

And as we -- you've heard the stories this morning about all the areas of growth, and customers wanting us to solve their problems more completely. We're adding more ingredients like software, getting paid for it. So I think that's the piece that we'll see the upsurge. And tactically, it will be, I think thinking of it in terms of flatness is a better way to manage that part of the question.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. On the capacity question, so it's a bit of a vicious cycle, right? The long lead items is getting the tooling. The tool guys are waiting for us to get them the chips. So we are working through that together, but I expect the majority of that capacity to be in place, say, in roughly a 24-month window.

Ross Clark Seymore - *Deutsche Bank AG, Research Division - MD*

Ross Seymore from Deutsche Bank. Vince, a strategic question for you. At the high level, you spend about the same amount, maybe a little bit more on R&D dollar-wise than your biggest competitor, but percentage of sales-wise, it's about 2x. If you flip that around on the capital side of things for CapEx, it's the other way around. What's the upside and downside of why you chose to focus on the R&D side of the equation? And is there a level at which revenue-wise or otherwise where you would actually consider doing significantly more manufacturing internally?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. Good question, Ross. So I think when it comes to the R&D question, we're very opportunity-rich. We've got more subscription for the capital then we can actually deploy. But 1.7 puts us clearly, fairly and squarely, at the high end of the analog industry. And we're very, very comfortable with that. And as I said, we're opportunity-rich. We're all the time -- as Prashanth said during his formal presentation, deploying that capital into the most attractive markets is really important to us. And I feel okay.

But by the way, the growth is the elixir for everything. So I think the best way to think about ADI's R&D moving ahead is on an absolute basis. It's -- we've gone from kind of 20%. We're getting down into the mid-teens. And perhaps that's a good place to be for ADI for the longer term.

On the CapEx side of things, the hybrid model we have, I believe, is the way forward. We get to leverage the capital of our suppliers. We have tremendous flexibility in terms of how we balance the internal needs -- or the internal factories versus the external factories that we use through our suppliers.

And my sense is that CapEx light is the right way to think about this analog business where you need fundamentally resiliency and optionality. That's what this business is all about. So I think a hybrid model where we have adequate capability internally to be able to supply our customers' needs for the long term, but also being able to leverage similar recipes in external factories so that we're able to manage the upsides and the downsides in a much more balanced way than doing everything completely vertically.

Ambrish Srivastava - *BMO Capital Markets Equity Research - MD of Semiconductor Research & Senior Research Analyst*

Ambrish from BMO. Thank you first folks for putting up a really good show, worth most of us -- those of us who have come from across the country, worth the trip.

Prashanth, I had a question on margins. And I wanted to tie up what we heard in the presentations with your financial model. So some of the newer businesses are growing at much faster than the corporate average, which I understood. But I thought you made a pretty -- in my mind, pretty positive statement about the new trough being the old peak. But we haven't seen a trough like we saw back in the financial crisis. And the pandemic, we thought we would go in there, but then we bounced back pretty quickly. So just help us unpack the model a little bit more. And I think one of the pieces that you did not cover was DOI. Does that change, and you flex that because all the products are long-lasting. So thank you.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. No, great question, Ambrish. So let's make a couple of comments on margin. First, you can see where we're operating at today. And that's an environment where there is a lot of things going our way, which are providing some great tailwind to gross margins. And you've heard from the BUs that there's a lot of reasons that gets better, right? As we continue to go up the stack, and we continue to do more of those solutions that you heard from the BUs as well as analyses, higher ASPs come with that, more digital software content is very accretive to margins.

So all of that is good for the business. You've heard Vivek talk both about P90 as an ability to reduce our cost structure, also very helpful from a margin standpoint. His flex model of being able to move in and out between boundaries and internal capacity allows us to manage our absorption at a level that is much better than we've been able to do historically because of our scale. So we have a lot of structural changes that I think help us with the margin outlook on a go-forward basis.

What we don't control clearly is mix. We have some parts of our business that are below the company average, some are above. I made a particular comment about consumer. Consumer is very accretive to operating margins, but it is dilutive to gross margins. So -- but that is a trade that makes sense for us given that we are leveraging the R&D that's been spent by the B2B side.

The other item that we are -- and we've been public about this in the past is, we want to give the field teams the flexibility they need to be modestly more aggressive in pricing, particularly for products that are released. R&D has long been expensed. We've got the products already out there. And

if it makes sense for them to have a little bit more pricing flexibility to capture that growth. We want that to -- we want them to have that flexibility, and that's why we've set that at a 70% floor. I expect that we will be operating north of that 70% floor for the majority of the cycle.

Ambrish Srivastava - *BMO Capital Markets Equity Research - MD of Semiconductor Research & Senior Research Analyst*

Sorry, the days of inventory target.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

We're still working through what that looks like in a combined maxim situation, and given what we've learned from the supply chain crisis. I think that the manufacturing teams have gotten some significant data insight into what are the levels where it makes -- where given the broad spectrum of products that we have, where does -- where do we really start feeling the pain point. So we'll talk a bit more about that on a go-forward basis, but don't expect meaningful change. We do know that today's levels are far too painful for our customers. So it does need to go back up.

John William Pitzer - *Crédit Suisse AG, Research Division - MD, Global Technology Strategist and Global Technology Sector Head*

Great. John Pitzer, Credit Suisse. So let me echo thanks for the presentations this morning right here in the middle. Sorry, I'm kind of hiding behind the camera. Many of the presentations this morning kind of made a solid argument as to why ADI should outperform many of its peers, and I tend to agree with that.

But when you look at that 7% to 10% kind of growth rate, that's sort of in line with what a lot of people think the new norm is for the industry. So I'm wondering if you could just talk a little bit about your growth rate with respect to -- are you going to outperform or perform in line with the industry? That's my first question.

And then, Vince, specifically on the second question, everyone loves the cash return story. But given what you've done with Hittite and Linear, and what you expect to do with Maxim, where does M&A fit into this, especially if we're in a stock market where valuation discussions might be a little bit easier.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Go ahead.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

You want me take the first part?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes, I'll take the first part. So again, to be clear, our midpoint on that new growth model of 8.5%, that's off a 2022 base. So I want to make sure that everyone gets that straight in the model that if you run that off at '21, you're going to end up north of 10%. I think the other piece that's very relevant there, John, is what are the assumptions that folks have for kind of the longer-term market growth, right?

And we do see a significant piece of our business still tied to GDP. So relative to GDP, we -- that overall business model is going to continue to grow well in excess of that market. So part of the challenge for folks who are learning the ADI story is that incredible diversification, which creates that high barrier to entry is also a real proxy for kind of global production and global economy because that is who we serve. Our customers really are the manufacturing companies in the S&P 500.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. So John, the second part of your question on M&A. Well, I think it's worth just stepping back a little and looking at what we've done over the last 7 years, I think it is now.

We've assembled through the acquisition of -- we've put the 4 beachfront properties under the 1 roof with Hittite, LTC, Maxim, all combined with ADI. So our standards are sky high, okay? I want to say that, but I also want to say that I'm very pleased with where we are now. I believe we have a growth story. I think this industry in general, it took 45 years for the semi industry to be able to get to $0.5 trillion of annualized revenues.

We'll probably double that in the next 10 years, okay? And I believe that the assets we've got under ADI now will be -- will enable us to achieve the growth rates that Prashanth and myself presented today. And anything we've ever acquired has a very, very high innovation ethos built into it. So if we do, but we're always looking, right, for assets. But I think where we are is a great place, making sure these 4 assets are totally unified solving our problems -- our customers' problems very coherently and achieving the full potential on a growth and profitability perspective, that's where our game is at -- and if we do anything in the future, I believe we're always looking at tuck-ins to give us more unique technology heft, perhaps more software, but I think that's the way to think about it, John.

Christopher Caso - *Raymond James & Associates, Inc., Research Division - Research Analyst*

Chris Caso from Raymond James. The question is about the hybrid manufacturing model. And we know that outsourced manufacturing's foundry capacity is very tight right now. Can you speak to your ability to get the capacity that you need to execute on that hybrid model? And most importantly, to get that capacity without some of the take or pays or other commitments that we've heard from others in the space, which would make it more difficult for you to pull business internal, and protect the margins in the event of a downturn?

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Sure. Yes. Maybe I'll take the first part of that. Then you can jump in.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Okay. Okay.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Just first, a reminder -- a comment that Vivek made that I think is often lost on the breadth of the technology that we need access to. 7 to 7 that's something to keep in mind. He has to be able to have access all the way from 7-micron to 7 nanometer, a pretty wide breadth, but that's critical to the breadth of capabilities that we offer. Second, in the model, we have taken into consideration a variety of different scenarios, and we are comfortable, so I'll reiterate again, higher capital spend in 2022 and '23, glide path back to mid-single digits in the future.

And in that construct, we can support the high single-digit revenue growth that analysis is focused on delivering. So we are comfortable that we can operate in that model. The second piece I would say is, when you think about who has heft in analog and who is still a real customer for these foundry partners. You can see the benefits of scale have come to play because we clearly get a very important voice with all of these foundry partners given what some of the other peers in the industry are choosing for their manufacturing strategy.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

I think the way we treat our subcontractors as well is very important. We take a long view. We don't chop and change. And that's built a lot of trust over the years. So that when we do have to look for help, as we have over the last couple of years in this excruciating supply environment, we've been getting what we need to a first approximation.

Everybody would like more, people who love to build more inventories, but we're getting pretty much what we need year-by-year.

Pradeep Ramani - *UBS Investment Bank, Research Division - Equity Research Analyst of Semiconductors*

This is Pradeep Ramani from UBS. I had a question on your revenue synergy time lines. It seems like they're going to start in fiscal '24. What is driving that time line? Is it supply? Or is it design cycles? Or what is -- or is it just a conservatism in your time lines that you could get revenue synergies a lot quicker though?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. Look, I think we're not at least talked about the customer piece of the synergy. It's about cross-selling. Now there are natural design-in cycles. We would see an uptick in our consumer business, perhaps first in terms of cross-selling. The cycles are more rapid. I think followed by automotive communications, and it takes just a bit longer to get the industrial market, given the cycles, although they're also speeding up there.

But I think that's how to think about that piece of it. And then there are areas where, for example, Pat O'Doherty talked about modules. Vivek talked about the micro modules that we build, where we combine lots of pieces into these 3D stacks. They are probably the best example of short product development cycles on our side to get design-ins with our customers. So I would say the cycle is largely controlled by our customer -- by the markets that we're selling into, different cycles in different markets. And it will be probably -- I think it will be realistically 2 years before we start to see any significant uptick in revenue synergy from the combination of Maxim and ADI. And then within 5 years, I expect that to be at a very strong steady state.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Pradeep, I would add that the same dynamics that have ramp of those opportunities slow is the wonderful dynamic that keeps that revenue pumping for decades. So if I had to trade, I will take the annuity with a longer entry than quick in and quick out.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We got a question from online from Stacy Rasgon with Bernstein. Operating margins in your new model, Prashanth, they're 500 basis points higher, but the free cash flow is the same or lower, CapEx intensity is only a little bit higher. Can you help us understand that?

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. Thanks, Stacy. So a couple of things behind that. First is that versus the prior model, we've had a meaningful change in the tax rate, which was providing some level of headwind in how we moved from our old model -- or I guess when we issued our old model and then the tax rate adjusted on us. So we never really caught up on that.

In the new one, we will expect some tailwind, but it will take a bit of time because as most of you know, R&D will now need to be amortized over several years, unless there's a change in the law here. That is going to provide some level of cash flow drag to really all our industry while we -- until

we hit that long-term run rate. And the second thing that I think we've concluded is you have to get the op margins up, and we need the financial leverage, and that is very much built in to this financial model.

Vince has just reinforced it again when he answered Ross' question about feeling quite comfortable at the $1.7 billion spend. So we grow that revenue growth without the corresponding growth in expenses, allow us to drive that op margins up with the CapEx light deduction, then you'll see the cash flow continue to accrete.

William Stein - *Truist Securities, Inc., Research Division - MD*

It's Will Stein from Truist, again. I want to talk about cyclicality and pricing as well. In the broader economy, we've seen both monetary and fiscal policy is very stimulative yet with people staying home from COVID, you don't get a lot more output. This drives inflation. Fed's trying to address that right now. This echoes in the semi industry, right? You've seen this demand extend to all sorts of electronics and the whole industry is behind our capacity. So this is driving pricing up. Have we ever seen this -- as I recall in the tech bubble, prices were still falling, even though demand was as hot as it feels today. And as we consider, let's say, the Fed is successful in tamping down inflation. Have you contemplated what this does to your business in terms of pricing? And should we be attuned to the potential for a downturn in the next year plus?

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. So -- we've never seen anything like it. I think if anything during the pandemic, what everybody has realized is how critical semiconductors are to every aspect of our lives, economic life, social life. I'm having more and more conversations with senior executives from our customers who increasingly want to know how they integrate ADI into their strategic thinking from an R&D perspective, long-term R&D, long-term supply chain.

And I think what that says as well is that certainly, in our business, we're never the long pole in the pricing tent. Customers are far more concerned about getting access to our products, getting access to our R&D ideas to help their innovation. So I think pricing will -- we're in, I think, a period of systemic inflation in the business in the semiconductor sector.

I don't think we'll ever go back, and we're clearly in the post-Moore's Law era now, where the economic productivity of semiconductors in terms of being able to follow the curve down to 3 nanometers, 2 nanometers, 1 nanometer. I think that piece of the value proposition has been exhausted. I think we're getting more density. We're getting lower power. We're still improving the functionality of the product. So I think for us, we think a lot more about how we increase the value of each successive generation of product that we're developing to get more and more value, get more and more ASP. And yes, we're smarter than we were certainly 5 or 7 years ago in more systematically managing the portfolio of the 75,000 product SKUs to be able to increase the value per unit, essentially.

Vivek Arya - *BofA Securities, Research Division - MD in Equity Research & Research Analyst*

Vivek Arya from BoFA. Maybe Prashanth, one for you and one for Vince, if I may. So Prashanth, you gave us the floor for gross margins. I would be interested in if there's a ceiling for gross margins also, if you could maybe share -- and more importantly, what kind of modulates you between that range? Is it just mix or is it anything else? And does floor mean that if there is a downturn, let's say, hypothetically semiconductor industry sales are down 5% or 10% next year? And does it mean you can operate above that?

And then Vince, I wanted to revisit this issue of your competitor who has a very different strategy, right? It's fascinating that in the same industry that 2 leading companies have completely different strategy when it comes to manufacturing. And their claim is that having this internal capability has helped us gain share over long periods of time, which is mathematically, right, accurate. So when you look at them putting on so much capacity, right? There's so much lagging edge capacity that's coming on in China. Does that give you a cause for concern that is the hybrid model really the right one? It has been successful. But given that the rest of the industry is putting on so much capacity, how do you make sure that your hybrid model is going to be the right one going forward? .

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Well, it certainly has been to date. We are producing industry-leading margins. That's without question. The margins are getting stronger. I think as well compared to our closest competitor, our business model is fundamentally different. We're playing the high-end game. And our ASPs are multiples of their ASPs. It's a different game we're playing. Our customers come to ADI for really high-value, high-quality innovation, high-quality execution, and we do that in multiple places.

So -- and I think the strategy we have in the hybrid manufacturing model, it goes hand in glove with that core business principle of playing at the high end and pushing that -- and continuing to push that over time. It gives us tremendous flexibility.

I mean the internally -- the vertically integrated model is great until the market turns downwards on you. And then that's where the strength of the hybrid model comes in. You get the flexibility, you get the shock absorption. But again, we're more about building more and more value into each and every product that we ship. And we -- our manufacturing system is set up to enable us to produce those products with the highest quality over multiple decades. And there are other models in the industry, as you've pointed out, but our one is what works for us.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. We're almost out of time. So I want to take -- I want to answer the first part of Vivek's question and then make some comments to follow up on what Vince said. How do you think about the floor? We think about the floor, the margin floor as over any given trailing 12-month period, it should have a 7 handle on gross margins.

Vivek, team needs time to flex. We have flex capacity in Oregon. We have flex capacity in Ireland. They can't do that instantaneously, so there can be a period while we're flexing more production internally and out of foundries that there could be a little bit of noise in there, but that is that flex capacity that allows us to keep utilization levels high.

And then to kind of wrap all this together, it's similar to the question that Ross asked, just to put it in simple terms. We invest heavily in R&D. That R&D drives innovation that innovation is reflected in substantial premiums that we get from our customers, but it also allows us to create much more complex solutions. These complex solutions have a much higher ASP. Therefore, our unit count is much smaller than others who are in this game. So when you think about the manufacturing model for ADI versus our peers, it is really artisan versus kind of the high volume. And that artisan is because those ASPs are the culmination of all of that R&D spend.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

We have time for one more question, and then we'll end the live portion. Last question please.

Unidentified Participant

You mentioned you guys are going to rethink maybe how you think about your inventory, when the dust settles from all the supply chain stuff. How do you think your customers are going to react to all this when we kind of return to normal? Are they going to hold more inventory? Are they going to direct your distributors to hold more inventory? And then are they showing an awareness of your supply chain and your foundry relationships to make sure that you can supply them?

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Yes. Yes. So I'll take the first part of that, but I'm going to let Vince talk more to the customer. So when we think about optimal inventory levels in the channel, it is -- how do you find that right balance given that there are such a broad number of SKUs that we have the right products available in the right markets when customers need it. And I think what we have learned from the pandemic is using aggregate numbers like weeks of inventory is a little bit too peanut butter, right? We need to improve our data analytics, which we have the systems to do to be able to identify and

talk internally with a bit more granularity so that we can make sure that we have the ability to supply customers now that we've also added the whole portfolio of Maxim to the -- to our kind of set of SKUs.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Yes. How will customers think about it as they move ahead. I think it depends very much the sector. The automotive industry has been the most impacted. Just-in-time process systems for managing inventory and factories. My sense -- and with a very, very complex supply chain as well. So my sense is that's an area where there will be a rethink as to how factories and inventories are managed. And yes, the -- as I said, what's more important for our customers in terms of changing their inventory models, let's say, in the industrial or other sectors is getting access to our thinking and our supply chain and being able to get closer to us to get more surety around supply.

So yes, it will certainly have an effect, I believe, generally speaking, there will be more inventory on the collective balance sheet. And the question is whose balance sheet it's on.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

And as a reminder to folks who are new to the story, we manage inventory through the channel. The only people that really kind of pay attention to what inventory is in the channel is really manufacturing and finance. The business unit guys who are working on demand, they look at it from a point of sale standpoint. The data we share with Vince as he looks across the enterprise is point of sales. We don't pollute that with what's happening at POA.

Michael C. Lucarelli - *Analog Devices, Inc. - VP, IR and FP&A*

All right. Thank you, everyone. Those online, thank you for joining. You are free to enjoy the rest of your day.

If you're in person here, there's lunch upstairs. And in about half an hour, the demos down here are open. So go get some food. Thank you, everyone.

Vincent T. Roche - *Analog Devices, Inc. - CEO & Chair of the Board of Directors*

Thank you.

Prashanth Mahendra-Rajah - *Analog Devices, Inc. - Senior VP of Finance & CFO*

Thank you all.
