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**MWC19**

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**ANNOUNCER:** Good evening, please welcome to the stage Microsoft CEO Satya Nadella.

(Applause.)

**SATYA NADELLA:** Hello, and welcome to our event today and a big thank you to everyone who is here as well as everyone joining online. It's fantastic to be back at MWC. It's really an awe-inspiring time to be in this industry and witness the rapid transformation that's taking place.

Today we have a couple of very exciting announcements. And I was reflecting, it was just four years ago that we introduced HoloLens, ushering in a new era of mixed reality seamlessly bridging the physical and the digital worlds. One of my favorite lines from our announcement that we used to describe the possibilities was, when you change the way you see the world you change the world you see.

And it's incredible to see how people have applied those advances to do just that, transforming how medical students learn, preserving ancient historical landmarks and cultures and providing that heads-up, hands-free assistance to firstline workers everywhere. This new medium is just the beginning of experiencing what's possible when you connect the digital world with the physical world to transform how we work, learn and play.

Today this is more pronounced than ever. Computing is embedded in our world in every place and in everything. Mark Wiser captured it best when he wrote some three decades ago, the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they're indistinguishable from it. That's the world today.

Computing is becoming part of every aspect of our work and our daily life. This computing in every place, in our homes, in our offices, factories, stadiums. There's computing in every industry, oil and gas, retail, agriculture, financial services. And there's computing in everything from connected cars to connected refrigerators, smart surgical tools, and even smart coffee machines.

This era of the intelligent cloud and intelligent edge is upon us. It's being driven by three massive monumental shifts. First is that computing is no longer confined to a device or even a single data center. Instead it's ubiquitous fabric. It's distributed from the cloud to the edge, closer to where data is generated. And with the ability to adapt to the wide range of inputs, whether it's touch, speech, vision or gestures.

The second is AI. We've seen tremendous progress in the recent years achieving human parity in object recognition, speech recognition, machine reading and comprehension, translation. These are not just breakthroughs that are theoretical. Instead AI is being infused into every experience mediating our interactions and distilling the knowledge from everything around us.

And the third shift is about putting people at the center instead of the device. For years we've built applications and experiences specifically for given devices. But the interaction model going forward is with computers and computing all around us, it's no longer about being device-first, it's about putting the human first and it includes all the devices in their lives.

Together these advances are shaping that next phase of innovation, enabling experiences that previously would have been unimaginable and technological breakthroughs that have been impossible. That's the world in front of us. This opportunity is what grounds us in our mission to empower every person and every organization on the planet to achieve more.

These aren't just words for us. Our mission determines what we build and how we build it, and it defines how we view the role of technology in our society and in our world. It starts with thinking about how we can help every person, every company and even every country, how can they prosper in this new era? Our success lies in the success of our partners and customers and our ecosystem. This requires that we collectively move from being just passive consumers of technology to active producers of technology.

We create technology so our customers can build their own technology and this is an imperative that's becoming even more important. Today every company is a tech company and every organization will need to build its own digital capability to compete, to grow, and to prosper. The next big tech breakthrough, the next advancement that will transform our lives will come not just from another technology company, but from a retailer, or a healthcare provider or an auto manufacturer.

For organizations that means we must be their trusted partner, empowering them to build their own digital capability, not to be dependent on Microsoft, but to become independent with Microsoft. The defining technologies of our times, whether it's AI, cloud, mixed reality, cannot be the province of a few companies. It must be democratized so everyone can benefit.

Let me give you one example. Chelsea Potts, a mother of two young children, who was proud to land a job in rural Ohio, outfitting the interiors of truck cabs. It was her dream job. It pays well. It requires high skill. But, picking up the skills required and the job can be stressful, especially learning that intricate sequence of tasks and you're just getting started. But what if she had a tool that empowered her on the job that seamlessly guided her through each step, so that she could be confident that from day one eliminating any learning curve?

That's what we are building technology for, to give each of us super-powers, to enable more people to thrive and fully participate in our economies and to move us from an economy based on just consumption to an economy based on creation.

At the same time I'm clear-eyed about the unintended consequences of these advances. That's why we've committed to earning our customer's trust and instilling trust in technology across everything that we do. That's why we believe privacy is a fundamental human right. That's why we prioritize cybersecurity, not just for the largest of companies, but for small businesses and consumers, who are often the most vulnerable to cyberattacks. And that's why we build AI responsibly, taking a principled approach and asking the difficult questions like not what computers can do, but what computers should do. Our collective opportunity has never been greater.

Imagine a future where every construction worker can visualize what their project will look like in two days, or even in two weeks. Predicting what will happen with astonishing accuracy. They can understand the state of the construction site, no matter how complex. If they're behind, to be able to ask why, what's the problem and adjust, and get back on track.

In healthcare more than 1 million hospital patients fall each year just in the United States, 11,000 of them unfortunately are fatal falls. But, imagine a future where the precursors to a fall are being understood. And a nurse receives an alert before the patient falls. The nurse reaches out to the patient potentially saving a life.

And imagine a future where students in a classroom see historical objects in intricate detail, as their teacher describes them. They can walk around the artifacts, resize them, move them, creating their own learning museum and bringing the past back to life.

But we don't have to just imagine it, this future is here. Applying technology to empower every individual and every organization so any hospital, any small business, any startup with a world-changing vision and a passion and ingenuity to see it through can have meaningful impact. So they can bend the cost cover of healthcare, expand access to education and create new jobs. That's what we're going to show you today.

Let me welcome Julia onto the stage to start us off.

Thank you all very much.

(Applause.)

**JULIA WHITE:** Satya painted a picture of the possibilities born of the intelligent cloud and intelligent edge experiences. Let's now turn to some of the ways that these new experiences are developing. Now, over the past few years you've likely heard a great deal about Microsoft's global intelligent cloud capabilities, including Azure, Office 365 and Dynamics 365.

Well, today I want to focus a bit more deeply on the intelligent edge side of this story. And if you look at what's happening at the edge it's quite remarkable. The first is it is a massive number of these edge devices becoming connected devices and therefore able to work in concert with the cloud. Now, to put this in perspective, 20 billion connected devices is three times the number of cell phones in the world today.

Now, the next key aspect of the edge is the sheer diversity. The variety of edge devices is vast, and it includes a massive set of participants. And this is why we have taken an ecosystems-first approach. We work with over 10,000 IoT partners to create solutions that span their IoT devices and Azure Cloud Services.

And last April we announced our $5 billion investment in IoT through 2022, toward enabling the development and customer adoption of these IoT solutions. So that begs the question, what is Microsoft's role in this edge ecosystem? It's already vast, so it only makes sense for us to create a new device, when we had unique capabilities or technology to help move the industry forward.

Now, a great example of this is Azure Sphere, which is our highly secured microcontroller, or MCU, that runs in edge devices. As we watched consumer and home devices increasingly become connected, thermostats, the kitchen appliances, baby monitors, we also saw the growing security threats. These consumer device manufacturers aren't usually cybersecurity experts. And after a few major industry-wide security breaches, we knew we needed to do something to help the industry and to help ensure all of our safety.

And we worked across Microsoft to do this. We took our years of silicon-level security knowhow from the Xbox Console team, and years of working on the Windows operating system-level security and applied that to a Linux kernel, to run on a tiny MCU. And then we added Azure Security management capabilities, to provide the world's most secure MCU, able to run across a broad set of edge devices.

Now, companies like Starbucks are able to use Azure Sphere to securely connect their coffee machines across their global locations. This enables Starbucks to ensure their coffee machines are always running properly, maintained correctly, energy efficient, and always able to serve their customers that perfect cup of coffee.

Now, another aspect of the intelligent cloud and the intelligent edge solutions is the ability to bring together the digital and the physical world. And this is because those edge devices sit within the physical world, while being enlightened by the cloud. This means that a camera running at a construction site doesn't just record video, but it actually understands the environment, the people, the things, and it's with this understanding that it unlocks new solutions that can improve safety on the job site, or enable greater efficiency in the building process.

And as we have developed these powerful cloud services, like Azure Digital Twins and Azure AI, we discovered that the industry actually lacked an edge device capability of unlocking this potential. And as we did with Azure Sphere, we looked across the company. And we quickly realized that, once again, we had very unique capabilities to help our customers realize this potentially.

It was nearly a decade ago that we released Microsoft Kinect, with a depth sensor that allowed computers to better understand the real world. And while it started in gaming, Microsoft Kinect was used in solutions spanning education, healthcare and science, and we realized that this revolutionary technology could play an important role in bringing together the digital and the physical world understanding.

Today, I'm incredibly proud to announce Microsoft Azure Kinect, a new intelligent edge device that enables developers to create a wide range of AI-powered experiences. The Azure Kinect is a small, versatile device, built for developers and works with a range of compute types.

We brought together our best-in-class depth sensor that is one of the most advanced pieces of technology we have ever shipped. And then we combined it with a high def camera and a spatial microphone array, designed and built by our Microsoft Devices Team. Azure Kinect is an intelligent edge device that doesn't just see and hear; it understands the people, the environment, the objects, the actions. And the level of accuracy you can achieve is unprecedented.

Azure Kinect can be used individually or works together to provide a panoramic understanding of the environment. And the depth sensor has options of either a wide or a narrow view, to perfectly tune to each use case. And paired with Azure it creates opportunities for intelligent cloud/intelligent edge solutions we haven't seen before.

Now, through our early adopter program we've seen the way that Azure Kinect can help across industries. Take DataMesh, there's a Fast Company Top 50 Innovative Company in China that creates solutions for auto manufacturing. And a key challenge in manufacturing is ensuring that the many frontline factory workers have the guidance to install the right part in the right way.

Now, each car has thousands of parts and many look very similar. So it's a difficult challenge. Well, DataMesh has begun testing Azure Kinect to create a solution that compares the digital car design model to the physical parts on the factory floor. This helps ensure that the factory workers are using the right part in the right way, ultimately helping improve automotive safety and reliability.

And then there's Eva Retail, a pioneer in retail store technology. They're working on a solution with Azure Kinect and combined with Azure AI, enabling high accuracy solutions for both self-checkout and grab-and-go shopping.

And then in healthcare, we're working with Ocuvera, the only company with an AI computer vision-based patient fall prevention system. And they're working with partners like Cleveland Clinic. As Satya spoke earlier about those fatal patient falls in hospitals, it's, in fact, Ocuvera that is building this solution, with Azure Kinect, to proactively alert nurses to a likely patient fall, so the nurse has the ability to reach that patient before the fall occurs. We are very excited to be working with Ocuvera to get those fatal patient falls from 11,000 each year down to zero.

Speaking on behalf of the Azure Team, and the Microsoft Devices Team, I'm incredibly proud to bring this technology to market. Azure Kinect costs $399 and developers can preorder it today.

Now, let me introduce my dear friend, my partner in crime, and some might even call him a magician, Alex Kipman.

(Applause.)

**ALEX KIPMAN:** Thank you, Julia.

It all began with a simple question. How can technology adapt to people instead of people adapting to technology? Now, this simple question has fueled our work since 2008. Kinect was the beginning of the answer and the first intelligent device to enter our homes.

Kinect recognized this, understood what we were saying. It understood what we were doing. In 2010 Kinect transformed the way we play, by turning voice and movement into magic. And the experience of being able to just reach out into space and play made us realize just how confining living life through flat, two-dimensional screens really is.

It drove us to find a way to bring the digital experience into our physical world. It drove us to create Microsoft HoloLens, the first holographic computer. In 2016, HoloLens started the mixed reality revolution by bringing intelligence to the edge of computing. And over the last three years individual developers, large enterprises and brand-new startups have been dreaming up beautiful things, helpful things, inspired things.

These mixed reality experiences have been used by hundreds of thousands of people changing the way we work, communicate, learn and play, which leads us to today, the next chapter in our journey. Say hello to HoloLens 2.

(Video segment.)

On behalf of the entire global mixed reality community who have been with us every step of this journey, I'm extremely proud to introduce to all of you HoloLens 2. With HoloLens 2 you once again set the highwater mark for mixed reality and for intelligence on the edge of computing. To our customers, partners and fans, thank you, from Germany to China, from Japan to the United States and everywhere across the globe.

We have been listening to your feedback and you have been asking us consistently for three things. First, you have been asking us for more immersion so that you can see more of the holographic landscape. Second, you have been asking for more comfort so you can stay immersed for longer periods of time. Third, you have been asking for industry-leading value right out of the box so that you can start instantly with mixed reality solutions designed for the modern workplace.

So let's start today by talking about immersion. The most important aspect of immersion is defined by how much holographic detail your eye can perceive for each degree of sight. Forty-seven pixels per degree of sight is an important number to remember. Now this is important because this is what allows us to read 8-point font on a holographic website. This is what allows us to have precise interactions with holograms and ultimately this is what allows us to create and be immersed in mixed reality. HoloLens 1 is the only headset in the industry capable of displaying 47 pixels per degree of sight. And today I'm incredibly proud to announce that with HoloLens 2 we more than doubled our field of view while maintaining 47 pixels per degree of sight on HoloLens. (Applause.)

To put it in perspective and to highlight the generational leap, this is the equivalent of moving from a 720p television to a 2k television for each of your eyes. Now no such technology exists in the world. So in the same way we had to invent time of flight sensors for Kinect, waveguides for HoloLens and a holographic processing unit for AI inferencing on the edge, with HoloLens 2, we invented an industry-defining MEMS display. Now these are the smallest and most power-efficient 2k displays in existence. Now they allow us to dramatically grow immersion while shrinking the size of the displays.

But immersion is about more than just the holograms are placed in the world. Immersion is also about how you interact with them. HoloLens 2 adapts to you. It adapts to your hands and goes beyond the gestures to give you the satisfaction of direct manipulation, letting you experience what it feels like for the first time to actually touch a hologram.

To top it off, HoloLens 2 now also understands precisely where you're looking, enabling us to do things like understanding your intent and adapting the holograms in real time to your eyes. Then using the same cameras, we've enabled Windows Hello, iris-based biometric authentication, the most sure and reliable enterprise-grade solution.

So to complement immersion, let's talk about comfort. We optimized HoloLens 2 for long-wear and comfort. Keeping with Microsoft's tradition of inclusive design we 3D-scanned the heads of thousands of people across a wide range of ages, genders and ethnicities. And we then used this data to create a device that once again sets the highest bar for both ergonomics as well as comfort. HoloLens 2 has a universal fit system that works on the broadest and most diverse range of people, whether you wear glasses or not. Putting it on should be as simple as putting on your favorite hat.

We reduced the weight of HoloLens 2 by making the front enclosure entirely out of carbon fiber, making it light and durable and a device that is ready for the modern workplace. And we also fundamentally changed how the weight is distributed, making you feel as if the device is floating on your head. Now, as a result of these and hundreds of other changes, I'm incredibly proud that with HoloLens 2 we more than tripled the comfort of the device. HoloLens 2 sets a new standard for comfort in mixed reality headsets.

Now the list of innovations in HoloLens 2 goes on and on, but instead of telling you about it, why don't we show you. Please help me welcome on stage a great researcher and engineer from our HoloLens team, Julia Shwartz.

(Applause.)

**JULIA SHWARTZ:** Thank you, Alex.

Hello, Barcelona, hello, world. I am incredibly excited to be here. Today I get to show you something very special, it's something we've been looking forward to for many years. When we set out to build HoloLens 2, we wanted to create something that you didn't need to learn how to use. You should just know it. And we called this instinctual interaction. Let me show you.

Now, as Alex mentioned, HoloLens 2 is very comfortable and fits just like a hat. And the only thing that's even more effortless is how I'm automatically signed in. With Windows Hello and iris-authentication, the HoloLens 2 is actually signing me in as I put on my device.

Now, not only does the HoloLens 2 recognize me, it also recognizes my hands. Look at this: fully articulated hand tracking. And as I move my hands around, the HoloLens 2 is actually calibrating to my unique hand size. And, of course, not only does the HoloLens 2 recognize me and my hands, it also recognizes the world.

Welcome to my mixed reality home. This is the place where I have all the apps and content that I use every day. Let's check some of them out. Now, I've seen many people put on HoloLens for the first time and the first thing people do when they put on the device is they reach out their hands and try and touch the holograms. And now you can.

Look at the way the hologram is responding to my hand, almost inviting me to touch it. And, in fact, I can just grab this corner to resize it or I can rotate it or move it. That's right. We are touching holograms.

This is an app I've got called Spatial. Let me just put it right there. I've got another app here called Viewphoria View (ph). Now, it's a little big, so let me just use two hands here to make it smaller, and then rotate it so you can see. There we go. And let me put it down here in your Spatial, maybe make it smaller. That's nice.

All right. Now let's switch gears and talk about a different kind of application. I've got a browser over there but it's kind of far away and I don't really want to walk over here. So let me just call it over with my voice. Follow me. This is a browser that's running Microsoft Teams, which is a tool that use back home to collaborate.

Let me see what the team has been working on. OK, it looks like they've got a surprise for me in the Playground app, I just have to say the words "show surprise." All right, so let me just open up that start menu here and then place the app and then launch it. So now we're actually exiting my mixed reality home and going into an immersive experience. But notice that that browser that I had actually followed me in. Now this guy should be really useful when you have things like emails or PDFs that you need to reference while you're doing your work. I don't really want it following me around, though, while I'm showing you all this cool stuff, so let me just put it over here and then we'll get back to it later.

Welcome to the Playground. We spent years exploring and refining interactions for HoloLens 2. And the Playground is just a tiny sampling of the many prototypes that we've built, tested and learned from. Our approach is basically to try out as many things as we could and look for the things that stood out.

So, for example, here I've got three sliders, each of them controlling this wind farm simulation, but each in a different way using a different interaction technique.

One of the things we tried is this touch slider here. So, here I can just stick my finger in the slider and have it go to a particular value to control that wind speed there. It felt OK.

We also tried this push slider, so this guy nudged from side to side kind of like an abacus, which was interesting.

Now, the interaction that really took home the cake, though, was this pinch slider. The way that works is you just pinch it and move it wherever you want. And what we found was that people really like that tactile sensation of their fingers touching as they grabbed then released.

And across the board, for all interactions, the audio and visual feedback as you grab, move, and then release were all really critical to making this experience feel connected. This is just so satisfying, I can't wait for you all to try this out.

All right, now let's move on to a different kind of control -- buttons. How do you press buttons on HoloLens 2? Well, you just reach out and press them.

Now, one interesting thing that we found about buttons was that the size of the buttons actually impacted the way that people interacted with them. So, for example, for the smaller ones, most people would use one or maybe two fingers, but for the larger ones, pretty much everyone used their entire hand.

And this is kind of interesting when you think about it because these objects don't really weigh anything, they're just digital things, but despite that, people would treat them like real things, almost as if the bigger one had more weight. I just love the way these move and the sounds that they play when I press them. It's great.

All right, how about something that uses all ten fingers? Well, to test that out, we built a piano. So, here I can just play a chord or I can play the keys one at a time.

All right, so, where's that surprise that the team had for me? Oh, that's right, I had to say those words, "Show surprise." Ooh! Look at that hummingbird over there. It's gorgeous. I wonder if it will fly to my hand. Yeah, oh, wow, this is beautiful. I just love the way that it's following my hand around. I've got to tell the team they've done a great job. And, in fact, I don't even need to use my hands to do this because I can use my eyes and my voice. That's right, HoloLens 2 has eye tracking. So, I can just look over this browser here and look at the bottom of the screen to scroll it and then send my message. Start dictation. The hummingbird looks great, exclamation mark. Send.

So, this is what we mean by instinctual interaction. By combining our hands, our eyes, and our voice, HoloLens 2 works in a more human way.

I want to thank the team back home in Redmond and across the world for all their incredible work to making this dream a reality. And I'm sure that I speak on behalf of all of us when I say that we can't wait for you, the world, to experience this for yourself. And we really can't wait to see what you create with HoloLens 2. Thank you. (Applause.)

**ALEX KIPMAN:** Thank you, Julia. That was incredible.

Now, we designed HoloLens 2 to be the most capable and powerful headset out there, and we're obsessed about doing it without the device ever getting in the way.

Rather than you adapting to the device, HoloLens 2 adapts to you. With HoloLens 2, we more that double the immersion while we more than tripled the comfort. But as you just saw, HoloLens 2 isn't just better, faster, stronger; HoloLens 2 also evolved our interaction model by significantly advancing how people engage with holograms, making the engagement more instinctual and more human.

So, we talked about immersion and we talked about comfort. What about time to value? Today, it can take between three to six months before mixed reality creates value for an enterprise. Now, this is because code needs to be written before you can unlock business value within an industry.

With HoloLens 2, we wanted to provide organizations across multiple industries immediate time to value, shortening this process from months to just minutes. And today, I'm proud to announce that with HoloLens 2, we will launch with a suite of solutions from Microsoft and a suite of solutions from our amazing industry partners -- solutions ranging from health care to architecture to manufacturing and many, many more.

HoloLens 2 is ready to provide professionals immediate time to value -- immediate value for doctors, immediate value for architects, immediate value for mechanics.

Let's start today by zooming into the set of solutions from Microsoft.

Last year, we launched the first two mixed reality solutions for Dynamics 365, Remote Assist and Layout. And since then, firstline workers around the globe are solving problems more quickly in all of their daily operations.

Remote Assist and Layout will be updated for and available on HoloLens 2. And today, we are launching a brand new Dynamics 365 solution for mixed reality, Dynamics 365 Guides.

Now, Guides was designed to help fill the pending skills gap by enabling business processes to be mined and workplace wisdom to be preserved.

Guides will help workers get up to speed faster on difficult tasks by placing step-by-step instructions right where the work is happening.

For example, take Alaska Airlines. They are already exploring how Guides can support new airline mechanics with mixed reality training so they can come up to speed faster. General Dynamics, on the other hand, is evaluating Guides as a way to capture the wisdom of experienced workers who have developed highly specialized procedures so they can be passed on to the next generation of workers.

And today, I am happy to announce that Dynamics 365 Guides is already available for preview across all of our HoloLens 1 customers, and it will become fully available for HoloLens 2 later this year.

Now, we're seeing incredible momentum with HoloLens, and I'm both honored and extremely excited to be partnering with industry pioneers. Pioneers on Philips Healthcare, Bentley System, Bosch, and many, many others to bring the next generation of mixed reality solutions to our enterprises worldwide.

So, let's talk about one of them. Imagine transforming any room into an infinite workplace. When you can teleport your presence anywhere and visualize and collaborate on your ideas with anyone effortlessly, you will forever transform personal computing -- single person, single device, single experience -- into truly collaborative computing, where devices become just lenses into our connected, mixed world.

And to show us true collaborative computing on HoloLens 2, please help me welcome on stage Co-Founder and CEO of Spatial and a very good friend, Anand. (Applause.)

**ANAND AGARAWALA:** Hi, everybody. It is so exciting to be here with Microsoft on our shared mission to elevate human collaboration. Today, companies tackling the world's biggest problems are, increasingly, spread across the world, and the HoloLens lets us work together as if we were standing next to each other face to face.

To show you how that works, let me just flip into Spatial here with my HoloLens 2 and materialize the room. Hi, Jinha.

**JINHA LEE:** Hi, Anand. Hey, everyone, it's great to be here on stage holographically.

**ANAND AGARAWALA:** It's great to have you here, Jinha. Can you tell everybody a little bit about what you're seeing?

**JINHA LEE:** Sure. I can see your lifelike avatar, which we generate in seconds from a 2D photo and we can walk around the stage with Spatial audio and use this whole space around us to collaborate as if we're all here together in the same room.

**ANAND AGARAWALA:** Cool. Now, to show you how companies are using Spatial to transform the way they work, let's invite Sven Gerjets, CTO of the iconic toy Brand Mattel, onto the stage.

**SVEN GERJETS:** Hey, guys. How awesome is this? So, at Mattel, we're undergoing a massive digital transformation that's touching all aspects of our business. This includes the way that we're using technology to design and to develop our products.

Our classic brands, like Barbie and Hot Wheels and Fisher-Price, they have diverse teams of designers, engineers, marketers and manufacturers that are spread all over the world. They can now come together in a Spatial project room, reducing the need to travel as much to get everybody on the same page.

When we're developing toys like this Rescue Heroes fire truck here, we're able to pin up dynamic content on virtual walls, like this PowerPoint, for instance, or videos or even concept art.

Teams can now rapidly exchange ideas and create a shared understanding without having to hop on a plane. We can even collaborate on 3D content like this fire truck model here. This allows us to find potential issues much earlier in the cycle. For instance, guys, take a look here.

**ANAND AGARAWALA:** Oh, yeah, I can see that's going to be a problem. So, I can pull out my Spatial phone app and write a quick note and then just hit send and it becomes a digital sticky note which I can just grab and stick right onto the fire truck so that we can have engineering revise this later.

**SVEN GERJETS:** We can also use Spatial much earlier in our design process to ideate and generate inspiration. Okay, guys, let's come up with some ideas for a line of aquatic toys.

**ANAND AGARAWALA:** Yeah. How about sea turtles?

**SVEN GERJETS:** Oh. That's really cool. Let's try sharks.

**JINHA LEE:** That's cool, how about jellyfish?

**SVEN GERJETS:** So, all we have to do is say the words, and they're instantly visualized right before our eyes. You can even click into one of these bundles and they expand into a full-blown internet search, complete with 3D models, images and web pages. Jinha, why don't we click into just the images here so we can get some good inspiration for this new aquatic line?

**JINHA LEE:** Sure. Every object you see in Spatial is physical and tactile so you can scroll through or pick up images you like and toss them up on the wall with physics.

**SVEN GERJETS:** And we don't have to just stick with digital content, I can actually pull up these sketches I did on my phone last night. Using that same Spatial app, I just pull up those photos, and hit Send, and they're instantly transformed into this digital environment.

**JINHA LEE:** Nice drawing. It's so easy to fill up your room with ideas, so we built this tool to help you quickly organize all these ideas. Let me select all of this. Let's make a grid, this goes to the wall.

**ANAND AGARAWALA:** Now, this entire room we've created is a persistent digital object that anyone can access or contribute to at any time. Whether they're using an AR or VR headset or even a PC or mobile phone.

**SVEN GERJETS:** So, that's right. Now we can have virtually rich visual rooms that we can keep up for the life of the product. That means no more tearing down war rooms all the time.

So Spatial and HoloLens are helping us drive improvements in our digital design and development processes, changing the way we create new toys. By bringing people together from all over the world to collaborate in the same virtual room, we're overcoming a natural barrier to our collective success -- that's people's desire for direct, face-to-face interaction when building commitment and trust.

We're so excited to see faster time to market and reduced need to travel, as well as the many other benefits that we're going to unleash at Mattel as we collaborate in mixed reality. (Applause.)

**ALEX KIPMAN:** Now, keeping with this theme of time to value, we have seen HoloLens get used in a variety of different environments -- environments ranging from construction sites to operating rooms to even the International Space Station.

Now, in many of these environments, HoloLens has been modified by our customers to fit their specific needs. But these take significant time, and the results aren't always as comfortable or as immersive as we would like.

So, with HoloLens 2 we wanted to change that. We wanted our partners to be able to customize HoloLens, so that their customers could get the best and most comfortable experience immediately. And, today, I am proud to announce the HoloLens Customization Program -- a program that will allow our partners to customize HoloLens 2 to meet all of their specific needs.

And the first partner to take advantage of our customization program is Trimble, a global leader, leveraging cutting-edge technology to transform the construction industry.

To tell us more about it, please help me welcome on stage Vice President of Trimble Buildings and an incredible partner, Roz Buick. (Applause.) Hi, Roz.

**ROZ BUICK:** Thanks, Alex. Hi, everyone. Trimble is a market leader in innovative digital technologies that transform the way the world works in industries such as agriculture, transportation, surveying and construction. We empower the workforce all the way from boots on the ground, field crews, to office employees and professionals, by deeply understanding and optimizing the operational and business workflows. And over the last four years, we've partnered with Microsoft to focus on mixed reality, innovating around software that brings actionable insights to the field and job site.

In construction, those solutions are used for workflows like quality assurance, training, visualization of 3D constructible models, offsite manufacturing, and prefabrication and fabrication.

And for many of our customers, mixed reality is no longer futuristic technology, nor a gimmick to get more clients. It's real -- real working technology that's adding value in the field every day.

So, let me tell you about one client example. A few months ago, a construction team working on a building project in Colorado were walking the site to validate the HVAC heating and cooling system to be installed the following week.

They used the HoloLens technology to view the 3D models against the already-built physical structure. And when they suddenly discovered a clash or collision between the mechanical and plumbing systems.

Fortunately, the HoloLens solution let them visualize that issue in context early so they could fix it before the installation team came on site. And that was in spite of months of coordinating the mechanical, electrical and plumbing models on a computer screen in the office. The issue was only discoverable by viewing the system via HoloLens in a real-world context on a one-to-one basis.

And solving that problem before any physical construction had started meant they averted a delay of more than a week. So, we're super proud to partner with Microsoft to transform to a new era in construction using Microsoft's latest technology with Trimble's unique, constructible and connected workflows, we're actually enabling intuitive 3D for everyone on a project. So, we're excited to be here to announce the Trimble XR-10 with HoloLens 2.

This is the first HoloLens 2-enabled solution in the world for frontline workers and environments requiring certified hardhat safety or personal protection equipment.

This system has all the same technical benefits of HoloLens 2 that you've heard about, but now with new construction workflow features to empower the worker in the field to do their work right first time.

And using advanced Trimble software for design and construction, the XR-10 lets architects, engineers and contractors to bring the 3D constructible model detail and process all the way from office to field and onto the tool.

So now you can visualize and build exactly what you want, and this helps you deliver your projects on time and on budget. The Trimble XR-10 will be available for first customer shipment at the same time as Microsoft HoloLens 2. Thank you. (Applause.)

**ALEX KIPMAN:** Thank you, Roz. As computing becomes ubiquitous and AI infuses our cloud and our edges with intelligence, how can we build a complementary edge and cloud platform? A platform where we can run low-latency AI on the edge and high-precision AI on the cloud. A platform where the intelligence of the edge is self-contained and doesn't require connectivity. And the intelligence of the cloud works across the different platforms, different sensor configurations and different form factors.

Today, I'm excited to announce that we're doing exactly that. We're enabling developers to combine the power of HoloLens with the power of Azure by introducing a suite of mixed reality services.

And although these are all cross-platform, HoloLens 2 is designed from the ground up with these services in mind.

The first service we're announcing is facial anchors, a full cross-platform service that supports ARKit, ARCore, and of course, HoloLens.

Put simply, this will enable the birth of the internet of holograms, a world where holograms can be shared with others across different devices and different form factors, a world where every device becomes a lens into our connected, mixed world.

The second service we're announcing today is Remote Rendering, a service that will help solve a key problem facing our community of developers. From automotive to manufacturing, from architecture to health care, our customers need highly precise and detailed representation of their 3D content. This service will enable developers to use the power of Azure to directly stream high-polygon content with no decimation through HoloLens, allowing HoloLens 2 to display holograms of infinite detail, far in excess of what's possible with edge compute or rendering alone.

When we combine the power of HoloLens with the power of Azure, our partners can deliver transformative solutions.

So, let's take a look at one of these next-generation experiences created by a great partner and a global leader in industrial IoT, PTC. PTC is using HoloLens and Azure together to drive digital transformation in industrial enterprises. And to show us, please help me welcome on stage the CEO of PTC and an inspiring mixed reality leader, Jim Heppelmann. Hi, Jim. (Applause.)

**JIM HEPPELMANN:** Hi, Alex. Thank you. It's great to be here. PTC is focused on enabling industrial enterprises to capture value at the convergence of the physical, digital and human worlds. We do this with an industrial innovation platform that includes ThingWorx for IoT and Vuforia for mixed reality.

One of our customers, Howden, part of the Colfax Company, makes a line of aeration solutions, which are essentially gigantic blowers that allow waste water to be treated and cleaned effectively.

Howden uses Vuforia and ThingWorx to provide their customers with an integrated self-service solution to avoid costly and potentially dangerous downtime. To tell you more, I'd like to invite Maria Wilson, who is the global leader of data-driven advantage from Howden, to join us on stage.

**MARIA WILSON:** Thank you, Jim.

**JIM HEPPELMANN:** Thank you, Maria.

**MARIA WILSON:** Hi, Alex.

**ALEX KIPMAN:** Hi, Maria.

**MARIA WILSON:** Howden, like so many organizations in the world, is playing in markets where downtime is increasingly unacceptable to our customers. We decided to use PTC's Vuforia Studio in a challenge to address this critical issue and to provide a really value, immersive, mixed reality experience to our customers through the use of HoloLens.

Today, we are streaming sensor data from our equipment into Azure IoT Hub directly into PTC's ThingWorx solution. And this seamless integration provides equipment operators everywhere in the world with the right information they need to keep the blower running at its best efficiency.

Now, let's have a look at how easy it is to create content in Vuforia Studio. And I'll start by using Vuforia Studio's drag-and-drop interface. This is a pretty seamless process because it allows me to import existing 3D CAD models of our equipment.

Next, they include sensor data. I'll simply drag in a ThingWorx IoT gauge to the right position and bind that to the data stream from the Azure IoT Hub. This seamless integration between ThingWorx and Azure IoT allows our customers to see a real-time visualization of the Howden digital twin model overlaid on the actual blower using mixed reality.

To further enhance this experience, we're also including instant access to other relevant asset documents like drawings, maintenance history and work instructions.

Finally, with just one click, this whole experience is published to Azure and ready for the operator to view.

**JIM HEPPELMANN:** This published experience can now be used in two different ways. First, in the context of the physical machine, it provides seasoned operators with critical insights and instructions to keep the equipment up and running, but it can also be used in a hologram form to train new or less-experienced workers before putting them into an actual operating environment.

Alex, would you mind sitting in for a new blower control room operator?

**ALEX KIPMAN:** I'm excited. Let's do this. All right, HoloLens is one. I see Vuforia, let's start the application. I see lots of different training experiences here. There's the blower one Maria was talking about. Let me go ahead and select it.

Now, I need to place it on stage. Let's pick center stage and place the big blower. Wow.

**JIM HEPPELMANN:** Wow, it's beautiful. So, Alex is now viewing the experience that Maria published from Vuforia Studio, which includes live IoT data streaming in from an actual blower out in the field. While this experience offers significant benefits from a time and cost of training perspective, thus far, it's only been geared for individual participation.

But now, let's make it more collaborative. By leveraging the Azure Spatial Anchor Service within Vuforia Studio, we can let Maria seamlessly join in Alex's experience. Maria can simply take out her iPad and launch Vuforia view.

Once Maria points her iPad at the same location where Alex placed the blower, she can participate in the mixed reality experience, making it far more interactive and collaborative.

**MARIA WILSON:** That's right, Jim. Now that Alex and I can share the same experience, I can create a number of different training scenarios. Alex, let's simulate a gear failure mode.

**ALEX KIPMAN:** Uh-oh, I see that gear vibration went down, and I have here threshold exceeded, please inspect. Let's go ahead and select that.

**MARIA WILSON:** Alex, I think you might be dealing with a broken gear tooth. And you will probably have to replace the gear assembly.

**ALEX KIPMAN:** All right, I'll roll up my sleeves and get some work done here. Let's do it. I'm ready.

**MARIA WILSON:** Right. I'm going to start the disassembly instructions for the gear assembly.

**ALEX KIPMAN:** There it is. I see it.

**MARIA WILSON:** Now that Alex is using HoloLens 2, he has access to a wide range of hand- and eye-tracking capabilities that are all available in Vuforia Studio.

**ALEX KIPMAN:** All right, let's put it back.

**JIM HEPPELMANN:** That is so awesome. Vuforia Studio allowed Maria and Howden to create a single mixed-reality experience without worrying about which platform it would be viewed on. So, Maria chose to drive the experience from her iPad because it allowed her to present various training scenarios through a 2D touch interface, while Alex chose to view the experience in a HoloLens 2 because he wanted a hands-free experience and the ability to view and interact with the CAD model.

Vuforia Studio's integration with Azure's Spatial Anchor Services took that one step further by allowing them to seamlessly share the same mixed reality experience.

**ALEX KIPMAN:** Inspiring, thank you so much, Maria.

**MARIA WILSON:** Thanks so much, Alex.

**JIM HEPPELMANN:** Thank you, Alex.

**ALEX KIPMAN:** Thanks, Jim. (Applause.)

**JIM HEPPELMANN:** Thank you.

**ALEX KIPMAN:** I'm just so inspired by our ecosystem, the vision our partners have, and their ability to bring everything together.

Today, you saw how Spatial is reimagining collaboration for mixed reality and we just saw how PTC is augmenting every worker to be more productive for mixed reality.

Now as we look to the future of computing, we still need to address one key barrier with technology today -- closed ecosystems. The walls that make our world feel divided and make our world feel broken. As leaders in mixed reality, we want to do it differently. We want the third era of computing, the era of mixed reality, to be future-forward and more culturally relevant.

As members of the mixed reality community, you want the future to be open -- open to your creativity, open to your ideas, open to your vision.

Now, imagine what we accomplish as a mixed reality community when barriers are removed and we transition from walled gardens into a communal garden. Today, Microsoft is making durable commitments on certain core principles across the openness of our mixed reality ecosystem. These principles define the rights for all mixed reality ecosystem participants.

Principle No. 1: We believe in an open app store model. Now, of course we'll have Microsoft Store, but developers will have the freedom to create their own stores as first-class citizens in our experience.

Similar to how SteamVR is a popular store for mixed reality content on Windows, we'll want any app store provider to feel welcome within our ecosystem.

Principle 2: We believe in an open web browsing model. Now, of course, we will have Microsoft Edge, but developers will have the freedom to create web browsers as first-class citizens in our experience. And today, I am proud to announce that Firefox will be joining us with a web-browsing experience native on HoloLens.

Principle No. 3: We believe in an open API surface area and drive model, and we'll continue to participate and guide open standards like OpenXR so that anyone can innovate within our headsets from the sensors that are being used to the differentiated experiences that are being created.

Now, with these principles in place, imagine the innovation and imagine the breakthroughs. I have great hopes and great dreams of what we'll accomplish together in this ecosystem. And to help us dream about this future, I am honored to invite an industry luminary to tell us about his dreams for a mixed reality ecosystem.

Founder and CEO of Epic, Tim Sweeny. (Applause.) Hi, Tim.

**TIM SWEENY:** Hi, Alex. Thank you. Epic Games and Microsoft have been close partners for more than 25 years, and we've really helped to shape the industry together with DirectX and Unreal, with Xbox and Gears of War, and most recently in opening up Fortnite with cross-platform play between seven device families.

Now we're here witnessing the birth of an entirely new generation of technology with augmented reality and HoloLens. I believe that AR is going to be the primary platform of the future for both work and for entertainment. And, you know, AR is going to play such an intimate role in our lives that we've got to establish clear ground rules respecting everyone's rights. That means open platforms, open ecosystems, and privacy protections that put the user first.

And that is exactly what Microsoft is launching here today. So, Epic will fully support Microsoft's HoloLens strategy now and for the long term. So, we're starting with the Unreal engine. HoloLens support is up and running now and coming to all developers in May. Unreal enables television and film producers, architects and industrial designers to bring photo-realistic final pixels to HoloLens in real time.

At Epic Games, we also make games. Perhaps you've heard of some of them. And though I'm not here to announce a game or consumer AR strategy yet, I am here to tell you that in the years to come, Epic will support HoloLens in all of our endeavors. We'll support HoloLens as an open platform, and we will resist attempts to build walled gardens around our lives.

**ALEX KIPMAN:** Thank you so much, Tim.

**TIM SWEENY:** Thanks, Alex. (Applause.)

**ALEX KIPMAN:** To close, I'm excited to announce that starting today, you can start coding with our mixed reality services on Azure, where we have the most accurate, most open, and easiest-to-integrate, cross-platform services for mixed reality. Get on HoloLens.com, you can pre-order HoloLens 2. Bundles start at just $125 per month. Or pre-order the stand-alone HoloLens 2 Enterprise Edition. What was $5,000 is now $3,500.

The pieces are now in place and I hope the path is now clear for the third wave of computing. Let's keep building it together so that we can collectively start to shape this not as a technology wave of computing, but as a human wave of computing. A wave where I hope you will enjoy creating the world of your dreams.

Now, speaking of dreams, I leave you with one last video -- an inspiring story by an inspiring partner. A partner that is transforming health care with HoloLens 2, value that will empower physicians worldwide to achieve more. Thank you.

(Cheers, applause.)

(Video Phillips.)

END