

# Apple Event

## Company Participants

- Alok Deshpande, Senior Manager - Camera Software Engineering
- Andrew Fernandez, Manager - Camera Systems Engineering
- Arun Mathias, Vice President, Wireless Software Technologies & Ecosystems
- Bob Borchers, Vice President of Worldwide Product Marketing
- David Wilkes, Manager, Acoustics Engineering
- Deniz Teoman, Vice President, Hardware Systems Engineering
- Francesca Sweet, Product Line Manager - iPhone
- Greg Joswiak, SVP of Worldwide Marketing
- Hans Vestberg, Chairman and Chief Executive Officer
- Hope Giles, VP, Hardware Technologies Program Management
- Kaiann Drance, Vice President, iPhone Product Marketing
- Lisa Jackson, VP of Environment, Policy and Social Initiatives
- Michael Chow, Executive Producer, Riot Games
- Tim Cook, Chief Executive Officer
- Unidentified Speaker
- Yael Garten, Director, Siri Data Science & Engineering

## Presentation

### Tim Cook {BIO 14014370 <GO>}

(Video Presentation)

Hello and welcome back to Apple Park. I am so glad you could join us today. Just last month we were here to introduce some great new products. Apple Watch Series 6, Apple Watch SE, as well as the eighth-generation iPad and the all-new iPad Air. And we've got some more huge announcements for you today. So let's get started with an exciting new product for the home we know you're going to love. This year, our homes have become even more important in our daily lives. So it's critical that the technology we choose for our home provides a truly great experience. When we approach designing products for the home, we focus on three key attributes.

First, they must be easy to use, from the initial setup to the way you interact with it every day. And we design our products to work better together, seamlessly and intuitively. We also design them to be secure and to protect your privacy. Because you should be the one in control of how your personal data is used. We applied these principles when we created HomePod. HomePod is a breakthrough speaker that combines precise, high-fidelity sound with the intelligence of Siri. It provides an entirely new way to discover and interact with music at home. And now we want to

bring this experience to even more people. So today, I'm excited to introduce the newest addition to the HomePod family. And I'd like to show it to you now.

(Video Presentation)

This is HomePod mini. And here's Bob to tell you all about it.

**Bob Borchers** {BIO 16442089 <GO>}

I'm so excited to tell you about HomePod mini. It's an incredible smart speaker, with a compact, elegant design that's perfect for your home. It's wrapped in a beautiful, seamless mesh fabric that not only looks great, but was created specifically for its acoustic performance. On top of HomePod mini is a backlit touch surface that provides controls for volume, play/pause, and even illuminates when you invoke Siri. But the design is just the beginning. In creating HomePod mini, we thought carefully about what you want from a smart speaker. First, you want amazing sound that ensures your music, podcasts and everything you listen to sounds incredible. Next, you want a world-class intelligent assistant that helps you wherever you are. And as our homes become smarter, you want it to serve as the brain of your smart home, orchestrating and controlling a wide range of devices. And finally, because it's your home, you want a smart speaker that puts your privacy and security at the forefront. All this is exactly what HomePod mini is designed to deliver. And to tell you more about how we made this happen, let me pass it to Dave and Yael.

**David Wilkes** {BIO 22161511 <GO>}

At Apple, we have a passion for music, so we knew HomePod mini had to sound amazing. We started by custom-designing every acoustic element. We created a full-range dynamic driver that delivers high output while keeping distortion to a minimum and developed a pair of high-excursion, force-cancelling passive radiators that enable amazing bass response. We also crafted an acoustic waveguide to deliver a consistent, 360-degree sound experience, enabling you to place HomePod mini anywhere. In order to get truly big sound out of this compact design, we combined it with the powerful Apple S5 chip and advanced software which all together enables something we call, computational audio.

Even before you hear the first note, HomePod mini is analyzing the unique characteristics of the music and applying complex tuning models to optimize loudness, adjust the dynamic range, and control the movement of the driver and passive radiators in real time. And all this happens over 180 times a second. The result is an audio experience unheard of in a speaker this size and one only Apple can deliver. Now, bringing amazing sound into your home isn't just about breakthrough audio quality. It's also about letting you enjoy that sound throughout your house. Multiple HomePod mini speakers can play perfectly in sync across your entire house. That's great for entertaining or keeping up with your favorite podcast as you get stuff done.

And when you place two in the same room, they'll intelligently become a stereo pair, filling your space with rich, enveloping sound. And to make HomePod mini the ultimate smart speaker for iPhone owners, later this year, you'll get a new Handoff experience that's truly magical. Using the U1 Ultra Wideband chip, which we introduced in iPhone last year, HomePod mini can understand, with high precision, when your iPhone is nearby. Bring iPhone close to HomePod mini and you'll get visual, audible and haptic effects. So it feels like your devices are physically connected as music flows from one to the other. And of course, HomePod mini can play all of your favorite content. In addition to Apple Music, you can listen to all your favorite podcasts, along with thousands of radio stations from iHeartRadio, RADIO.COM and TuneIn. And in the coming months, you'll be able to use services from providers like Pandora and Amazon. And because HomePod mini has the power of Siri, anyone in the home can ask to play an artist, album or track, hear a playlist, or even search for music by lyrics.

(Video Presentation)

Siri on HomePod mini brings you the music you love and helps you discover new favorites. But of course, Siri does more than just play your favorite music. To tell you more, here's Yael.

### **Yael Garten** {BIO 21510522 <GO>}

Siri is what makes a smart speaker, well, smart. Siri was the first mainstream intelligent assistant, and today it's the most popular in the world, available on over a billion devices and handling over 25 billion requests a month. And Siri keeps getting better. In the past three years, Siri's gotten faster and more concise. Speech recognition is twice as accurate. And Siri knows over 20 times more facts. Together, Siri and HomePod mini do everything you'd expect from a smart speaker, from multiple timers and alarms to weather reports to answering the random questions kids think up. But what really sets HomePod mini apart is Siri's deep integration with iPhone. Using Siri, HomePod mini can access the apps on your iPhone to send a message, check your calendar, make a call, even find your iPhone. And because of this, you'll be able to ask HomePod mini for a personal update with just a single request.

(Video Presentation)

Of course, your voice isn't the only voice in your house. Siri knows that and can recognize the voices of each member of your household so that everyone gets their own personal experience.

(Video Presentation)

And deep integration with iPhone also enables a magical experience with CarPlay. Ask HomePod mini what time Target closes and a Siri suggestion automatically appears in CarPlay, so when you hop in the car, the route is ready and waiting for

you. With the intelligence of Siri, HomePod mini helps you get things done around the home.

Next, let's turn to the smart home. When it comes to your home, you want comfort and convenience without complexity. So with HomePod mini, we've made the smart home simple. HomePod mini automatically integrates with the Home app so you can control all of your HomeKit accessories with just your voice. You can ask to turn down the heat, lock the doors, dim the lights, or even set a scene.

(Video Presentation)

To control multiple accessories with a single voice command. And if you're just getting started with your smart home, the new Discover Tab in the Home app makes it easy to find all kinds of great smart home accessories to control lighting, security, comfort and more. One of the most important parts of the smart home is communicating with your family, which is why we created, Intercom. Intercom lets you quickly send a message from one HomePod to another in a different room or to multiple rooms throughout your home.

(Video Presentation)

But what's really exciting is that we've taken it a step further and designed Intercom to also work with your iPhone, iPad, Apple Watch and even CarPlay, something only Apple can do. You'll get a home intercom system that goes everywhere with you.

(Video Presentation)

The message will automatically play on HomePod speakers throughout the home, and a notification will appear on your family's personal devices. And Intercom messages will play on AirPods as well, so you can always get your kid's attention.

(Video Presentation)

Intercom helps connect the members of your home in an entirely new way. We're so excited about how HomePod mini brings the power of Siri intelligence to your smart home. Back to Bob.

**Bob Borchers** {BIO 16442089 <GO>}

Not only is HomePod mini packed with great features, like every Apple product it's designed with your privacy and security in mind. Nothing you say is sent out of your home until you activate Siri with a touch or it hears those magic words, "Hey Siri." And your requests are not associated with your Apple ID, and you choose whether Apple saves your audio recordings. Personal requests only work when your iPhone is home with you, and all communication with smart home accessories uses strong encryption. We can't wait for you to enjoy the incredible experiences the new HomePod mini brings to your home. It comes in both white and space gray, and I'm

thrilled to announce that HomePod mini will be available for just \$99. And you can order HomePod mini November 6th, and it will start shipping the week of November 16th. So that's HomePod mini. With the power of computational audio, a world-class intelligent assistant, great features like Intercom and tight integration with your favorite Apple devices. And now back to Tim.

## **Tim Cook** {BIO 14014370 <GO>}

Now let's talk about iPhone. iPhone is an incredibly powerful and personal device. It's the product we use the most every day. With amazing capabilities, iPhone has changed our lives and has never been more indispensable than it is now. It's been another big year for iPhone. Ever since its launch, iPhone 11 has been the most popular smartphone in the world. People love their iPhones. iPhone has led the industry in customer satisfaction every year since it was first introduced. There's so much that people love about their iPhones. They love how easy it is to use, how it connects people in personal ways, how it elevates photography, keeps us informed and keeps us entertained.

With a powerful ecosystem of apps in the App Store, iPhone enables people to do more and more things every day. And users can trust that iPhone is designed to do all of this while protecting their security and privacy. Every decade, there's a new generation of technology that provides a step change in what we can do with our iPhones. The next generation is here. Today is the beginning of a new era for iPhone. Today we're bringing 5G to iPhone. This is a huge moment for all of us, and we're really excited. 5G will bring a new level of performance for downloads and uploads, higher quality video streaming, more responsive gaming, real-time interactivity and so much more. 5G networks are more advanced, with lower latency and less network congestion. So you can get higher network speeds even in densely populated areas.

And 5G even helps protect your privacy and security, since you won't need to connect to unknown, unsecured, public Wi-Fi hotspots as often. Each generation of cellular network technology on iPhone has enabled breakthrough innovations and entirely new opportunities for our developers and our users. And 5G is the most exciting step yet. For so many people, this all becomes real with 5G coming to iPhone. As you know, iPhone provides seamless integration of world-class hardware and world-class software. What you may not know about is the incredible collaboration between Apple and our carrier partners around the world to ensure iPhone users get the best possible experience. We're fortunate today to have one of our closest partners join us. I'd like to welcome Hans Vestberg, Chairman and CEO of Verizon, here to Apple Park. Hans, this really is a big day. And our teams have done some amazing work together.

## **Hans Vestberg** {BIO 1930652 <GO>}

I want to thank you and the whole Apple team for a fantastic collaboration leading up to this historic moment. Until now, most people have taken a "wait and see" approach to 5G. They've been waiting for 5G to get real, with the network coverage they expect, the incredible performance they have been promised, and the devices they love. Well, today with iPhone, the wait is over. 5G just got real. Of course, what's

the most exciting part for me as a guy who has worked in networking for 25-plus years? That fact that for the first time ever, iPhone can now access Verizon's 5G Ultra Wideband. It's built with large quantities of mmWave spectrum that enable unprecedented performance.

5G Ultra Wideband has already been recognized as being the fastest 5G in the world. And it's getting even faster. Our 5G network now gives you double the peak download speeds, over 4 gigabits per second today in ideal conditions and even higher over time. And double the upload speeds at over 200 megabits per second. So whenever you're watching a high-definition movie or you're planning business workflows with real-time augmented reality, you can be sure that there's no faster 5G anywhere on earth. 5G Ultra Wideband has, also, a massive capacity. We're building it to help remove bottlenecks in crowded places where thousands of people use their phones at the same time. Because one day we'll be safely back in those places. And so, we're nearly doubling our 5G-enabled stadiums, venues, airports, train stations, and lighting up some of the busiest locations in the country.

This enables amazing things, like reinventing the in-stadium fan experience with our NFL partners. The new Verizon 5G SuperStadium experience in the NFL app lets fans see and feel the action from up to seven camera angles, including views from players' eyes, and an immersive augmented reality like never before. We're excited for NFL to be rolling this out to many stadiums through the course of the season. And finally, 5G Ultra Wideband provides you with super low latency, so experiences like multiplayer gaming feel like they're happening in near real time, freed from the confines of your home. Together with Apple, Verizon has partnered with one of the world's leading gaming companies for some exciting news that you'll hear about later today. To make this incredible experience available to more people, we're doubling down on our fastest network, the 5G Ultra Wideband, with double the coverage in existing cities like New York, Chicago, Los Angeles, and expanding into new cities like Philadelphia and San Francisco, with 60 cities by year-end.

In addition to our 5G Ultra Wideband network, we have an extensive 5G network. And today, we're excited to announce that Verizon is turning on our 5G Nationwide network, reaching more than 200 million people across more than 1,800 cities and towns. So, all of the pieces have now come together, the coverage of 5G Nationwide, the unprecedented performance of 5G Ultra Wideband in more and more cities, the reliability you expect from Verizon. With the first 5G iPhone on the 5G America has been waiting for, we can finally say, 5G just got real.

### **Tim Cook** {BIO 14014370 <GO>}

Hans, this is definitely the start of something big. Thank you for joining us, and thank you for all the great work we're doing together. We are very excited about 5G on iPhone, and we're going to introduce 5G across our entire lineup of new iPhone models today. So now I'd like to show you the very first iPhone with 5G.

(Video Presentation)

Introducing iPhone 12. To tell you all about it, I'd like to hand it over to Kaiann.

## Kaiann Drance

Let's take a closer look at iPhone 12 with 5G. It has an all-new design that's simply stunning. It has smooth, flat edges, allowing the aluminum frame and glass to stay flush, front and back, creating this unique uniform construction. Inside and out, iPhone was re-architected to pack in new technologies into a smaller form factor. iPhone 12 was designed with 5G in mind, including the position of all-new antennas which go around the aluminum frame. The design looks amazing in five stunning new colors: Black, White, Product Red, Green and a gorgeous Blue.

iPhone 12 features the same great 6.1-inch display size as iPhone 11, yet we reduced the display borders to create a much smaller iPhone. If we compare it to iPhone 11, iPhone 12 is 11% thinner, 15% smaller in volume and 16% lighter. Keeping the display size and reducing the footprint was only possible by bringing our best display technology to iPhone 12. And that is our Super Retina XDR display. Our new Apple-custom OLED has many advantages over LCD. Each OLED pixel has its own light which can be individually controlled, giving us pixel-precision brightness, rich colors and an amazing two-million-to-one contrast ratio for true blacks in photos, videos, games. And Dark Mode looks fantastic. The new OLED display also has a higher resolution, with twice as many pixels as iPhone 11. It now has 460 pixels per inch. So text will be sharper for easier reading, and your photos will look better, with more detail, increased dynamic range and precise color. And peak brightness is nearly twice as high for HDR content: 1,200 nits, and we include support for HDR video formats: Dolby Vision, HDR10 and HLG.

We obsess over making your display impeccable, and of course it's important that we protect your display in the best way. The cover glass on iPhone 11 is the toughest in the industry, but iPhone 12 leaps ahead with something even better. Much better. Our incredible Materials Engineering team has been working closely with our partners at Corning, the leaders in glass technology, on a new cutting-edge material. And we call it Ceramic Shield. Ceramic Shield goes beyond glass by adding a new high-temperature crystallization step which grows nanoceramic crystals within the glass matrix to dramatically improve toughness. To make this material both tough and optically clear, we precisely control the type of crystals and degree of crystallinity. This was the breakthrough that made Ceramic Shield possible for iPhone. Ceramic Shield is tougher than any smartphone glass, and along with our new design it makes iPhone more durable than ever. We measured four times better drop performance. That means if your iPhone accidentally slips out of your pocket, Ceramic Shield will have four times the chance of surviving without cracking. This is the biggest jump in reliability we've ever had on iPhone, and we are thrilled to bring that to iPhone 12.

Let's talk more about the 5G capability on iPhone 12. As Tim said, to create the best possible 5G experience it required seamless integration of hardware and software, and partnering closely with carriers. Here's Arun to tell you more.

## **Arun Mathias**

I'm here in one of our 50 world-class anechoic chambers where we develop and test advanced wireless capabilities like 5G. And we approach this differently than anyone else. Starting with hardware, we designed custom 5G antennas and radio components that allow us to target exactly what works best in the entire system. We can be very space efficient while also including the most 5G bands in a single phone, to work on 5G in more places than any other smartphone. Another Apple advantage is our ability to engineer a fully integrated system from silicon to software. We analyzed our entire software stack from applications down to firmware to take advantage of 5G speeds. For example, we optimized iOS frameworks, so apps can get the benefit of 5G without using more power.

5G makes iPhone faster. We also made 5G smarter with Smart Data mode. When your iPhone doesn't need 5G speeds, it automatically uses LTE to save battery. But the instant 5G speeds do matter, iPhone starts using it. We also conduct rigorous validation. For example, this custom-built anechoic chamber helps us replicate signals from multiple sources and directions. We use this data to optimize our antenna system and our unique beamforming algorithms. To deliver 5G around the world, we collaborate closely with carrier partners, ensuring iPhone has great throughput, coverage, call quality and battery life. We've completed 5G testing on over 100 carriers in over 30 regions, and we're seeing impressive peak speeds on iPhone 12. Up to 3.5 gigabits per second in ideal conditions. Of course, 5G speeds will vary by carrier and region.

In the US, we also support mmWave, the high frequency version of 5G on all iPhone 12 models. This includes support for Verizon's 5G Ultra Wideband network. This technology is ideal for densely populated areas and crowded stadiums. With wider bandwidth, it can deliver even higher speeds. In fact, we have measured over 4 gigabits per second in ideal conditions and up to 1 gigabit per second in typical conditions. This is just the beginning, and we're excited to offer iPhone users the best possible 5G experience. Now back to Kaiann.

## **Kaiann Drance**

Now let's talk about the chip that powers the new iPhone. The A13 Bionic on iPhone 11 is still the fastest chip in a smartphone. That's until now.

We have a new chip developed by our world-class silicon team. A14 Bionic, the fastest chip ever in a smartphone. Let me quickly take you to our secret chip lab where Hope will tell you all about it. And finally, here's Hope.

## **Hope Giles**

Every year, iPhone sets the standard for mobile performance, even challenging the performance of laptops. This year, A14 Bionic also marks a very important milestone in the history of iPhone. A14 Bionic is the first smartphone chip in the world built on the latest 5-nanometer process technology. The reduction in transistor size enables



us to add features and increase performance, all while improving energy efficiency. Our Silicon Engineering team has packed 11.8 billion transistors into A14 Bionic, an increase of nearly 40% compared to A13. A14 improves performance and efficiency across the entire design of the chip, starting with the CPU. The new 6-core CPU in A14 is the fastest CPU in any smartphone. In fact, it's up to 50% faster.

A14 also features our latest 4-core GPU design, driving increased image quality and overall efficiency, so it's even better for advanced games and machine learning. And compared to the competition, it's the fastest GPU in any smartphone, delivering up to 50% faster graphics. We've also made significant architectural changes that push the limits of ML processing, a critical design investment to enable new experiences. We've dramatically increased the performance of our Neural Engine by growing from 8 to 16 cores. This change delivers up to 80% faster performance on the most critical machine learning models. This new Neural Engine is capable of an astounding 11 trillion operations per second. And we've also increased the performance of our CPU's dedicated ML accelerators, now 70% faster, so our developers benefit from considerably improved ML performance on our entire chip. Our silicon powers every experience on the iPhone, and with A14 Bionic we make those experiences even better with big updates to our CPU, GPU and a dramatic increase in machine learning capabilities. Back to Kaiann.

## **Kaiann Drance**

A14 Bionic enables console-quality games. With the faster speeds and lower latency of 5G, multiplayer gaming gets even better. Later this year, one of the best games of all time is coming to iPhone. It has held the prestigious title of most popular, most played and most viewed game in the world and revolutionized e-sports with over 100 million people watching the world championship last year. I'm, of course, talking about League of Legends. Using the power of the new A14 Bionic and Verizon's 5G Ultra Wideband network, iPhone gaming is taking an enormous leap forward. Here's Michael Chow, Executive Producer from Riot Games, to tell you more about it.

## **Michael Chow** {BIO 15873963 <GO>}

At Riot, we aspire to make games that meet our players wherever they are. League of Legends is the world's most popular PC game. But now with the insanely powerful iPhone 12 and Verizon 5G, we believe it's the perfect time to bring League to iOS. This is League of Legends: Wild Rift. The power of A14 Bionic literally blew us away. It allows us to show off champions like Ashe with a brand-new level of fidelity that you can't find on any other platform. With off-the-charts GPU performance and frames per second, you get amazing details and fluid gameplay, even in the most chaotic team fights. On iPhone 12, gameplay is always responsive and unbelievably smooth. Until now, to be competitive in League of Legends, you had to be tied to your desk. But Verizon 5G frees you to game like a pro pretty much anywhere, no Wi-Fi required. And with wicked-fast speeds up to 25 times today's networks, not only is gameplay fast, but so are downloads. So you can instantly grab dope new skins that show off all your favorite champs. We'll see you on the Wild Rift.

## **Kaiann Drance**

Wow, what a huge moment for mobile gaming. We can't wait to play League of Legends on iPhone 12. A14 Bionic also combines with our cameras and powerful software to deliver the new dual-camera system of iPhone 12. It has the Ultra Wide camera that people love and use to take inspiring photos in creative ways. iPhone 12 also has a new Wide camera with an f/1.6 aperture, our fastest yet. This allows more light to hit the sensor, making every photo better. Along with the wider aperture, we developed our first 7-element lens to maintain sharp detail in your photo from edge to edge. This delivers a 27% improvement in low-light performance, so photos and videos all around will have less noise and brighter results. Like in this photo, with fantastic detail in her hair, clothing, and the sun's reflection.

On top of this, we use computational photography to deliver even more powerful new features. Our Smart HDR 3 continues to bring out details in faces, like you see here when the sun is so bright behind her. Now it understands scenes with machine learning and applies more adjustments to distinct parts of the photo. For example, Smart HDR 3 brings out more detail in the rocks and uses sky segmentation to adjust for color, contrast and noise. Computational photography also enables Night mode, which has been called the best in the industry. Night mode on iPhone 12 gets even better. The faster aperture captures more light. And now, we are expanding Night mode to all cameras of iPhone 12, for the first time on the Ultra Wide and front TrueDepth camera, which is perfect for Night mode selfies. This is without a flash. These cameras are incredible.

Let's take a look at other photos shot on iPhone 12. This photo makes use of the Ultra Wide lens while maintaining sharpness and clarity like you see in the branches and leaves. Here's another Ultra Wide photo, shot from below. Just look at the amazing details in the clothing and chandeliers. In this low-light portrait photo, the color and warm light in the background come together seamlessly. For video, iPhone continues to lead the industry with the highest-quality video. And with the larger aperture, iPhone 12 video will get even better, with big improvements in lower light. We're adding Night mode time-lapse, with longer exposure and brighter frames when using a tripod. We wanted to show you iPhone 12 in action, so here's a video we shot and edited entirely on iPhone 12.

(Video Presentation)

With an amazing camera on the go and 5G speeds, iPhone 12 takes us into an even more wireless world. We love wireless charging, but want to improve the experience. When setting down your phone, you can miss the exact center of the charger, which can result in slow, less efficient charging, or none at all. So with iPhone 12, we are making this so much better. But that's not all.

(Video Presentation)

Introducing MagSafe for iPhone. To tell you more, here's Deniz.

**Deniz Teoman**

MagSafe is an advanced new system. It starts by improving the wireless charging experience. Our wound wire coil, which is unique in the industry, now accommodates magnets and maintains compatibility with existing Qi chargers. The magnets are optimized for alignment and efficiency. And we improved our shielding design to safely provide up to 15 watts for faster charging. We use a custom nanocrystalline shield to capture magnetic flux. We also added two new sensors: a single-turn coil NFC and a sensitive magnetometer, which senses magnetic field strength and can instantly react to it. This enables iPhone 12 to recognize and provide a better experience for accessories.

Any MagSafe accessory can simply snap onto the back of iPhone. So, this is really great. We're enabling a whole new ecosystem for MagSafe, starting with all-new cases for iPhone 12: silicone, clear, leather, which have magnets to snap on and off, and they're far easier to use. And you can use other MagSafe accessories on top of the cases, like the MagSafe charger. And there's a MagSafe wallet. It just snaps to the back of iPhone and also works on top of MagSafe cases. The leather sleeve uses MagSafe sensors to identify when iPhone is inside to reveal the clock.

We also developed the new MagSafe Duo Charger for your iPhone and Apple Watch. You can charge both devices with one charger, and it folds up easily for when you travel. And these are just the accessories we are introducing. Belkin is already working on a couple of new accessories: a car mount and a multi-charger dock. We can't wait to see the innovative ways that others will use MagSafe, creating a robust and ever-expanding ecosystem.

Back to you, Kaiann.

## **Kaiann Drance**

We also have some big environmental news for iPhone. To tell you more, here's Lisa.

## **Lisa Jackson** {BIO 7568663 <GO>}

Today, Apple is carbon neutral for our global corporate operations. Our offices, stores and data centers run on 100% renewable energy. And we're proud of how far we've come. But by 2030, we plan to have net zero climate impact across our entire business, including our manufacturing supply chain and all product life cycles. This means that every Apple device sold, from material collection, component manufacturing, assembly, transport, customer use, charging, all the way through recycling and material recovery will be 100% carbon neutral.

Many of iPhone 12's environmental features build on our past progress, removing harmful chemicals and using renewable and recyclable materials. And now, for the first time, we are using 100% recycled rare earth elements in all magnets, including the camera, haptics and MagSafe. We've also been transitioning our iPhone manufacturing partners to renewable energy. And just like we did with Apple Watch, we looked for ways to cut waste and use less material. Customers already have over

700 million Lightning headphones. And many customers have moved to a wireless experience with AirPods, Beats or other wireless headphones.

And there are also over 2 billion Apple power adapters out in the world, and that's not counting the billions of third-party adapters. So we are removing these items from the iPhone box, which reduces carbon emissions and avoids the mining and use of precious materials. Removing these items also means a smaller, lighter iPhone box. We can fit up to 70% more products on a shipping pallet, reducing carbon emissions in our global logistics chain. Taken altogether, the changes we've made for iPhone 12 cut over two million metric tons of carbon emissions annually. It's like removing 450,000 cars from the road per year. This is huge, and we're really proud that Apple is taking the lead. We hope others will follow, making this impact even bigger for our planet.

Back to you, Kaiann.

## **Kaiann Drance**

Now every iPhone will include the more advanced and higher power USB-C to Lightning Cable. It can be used with any standard USB-C power adapter or computer port. And USB-C enables fast charging. So that's iPhone 12 with 5G. But to add to all these big announcements, we also wanted to do something a little different.

(Music Playing) Something only Apple would do. (Music Playing) This is iPhone 12 Mini. With its amazing size, it fits in the palm of your hand, while still keeping the expansive edge-to-edge Super Retina XDR display. It's smaller and lighter than our 4.7-inch models like iPhone 8, but with a larger 5.4-inch display that let's you see so much more. With its compact size, the iPhone 12 Mini has the exact same features as iPhone 12. You're just choosing between two great sizes. In fact, iPhone 12 Mini is the smallest, thinnest and lightest 5G phone in the world. With its large screen and compact size, we think this will be an incredibly popular iPhone.

Everything on iPhone 12 and iPhone 12 Mini is the latest: 5G, the fastest chip with A14 Bionic, most advanced display with OLED, all-new design with Ceramic Shield, even better water resistance, new cameras for low light, and MagSafe. Let's see everything iPhone 12 can do.

(Video Presentation)

Even with these huge updates, the iPhone 12 lineup will start at just \$699 for iPhone 12 Mini and \$799 for iPhone 12. We also have great financing options from Apple as well as our partners. This includes a very special offer from Verizon. If you trade in an iPhone X or newer, you can get iPhone 12 starting at \$15 per month for 24 months, or iPhone 12 Mini for just \$12 per month. This is an unprecedented leap forward for iPhone. There is simply nothing like iPhone 12.

Back to you, Tim.

**Tim Cook** {BIO 14014370 <GO>}

(Music Playing) iPhone 12 and iPhone 12 Mini are absolutely amazing. They are the start of a new era for iPhone. Yet that's just half of our iPhone story today. We want to take it even further with our pro line of iPhones. And here they are.

(Video Presentation)

This is iPhone 12 Pro. I'd like to hand it over to Joz to tell you all about it.

**Greg Joswiak** {BIO 3260601 <GO>}

(Music Playing) iPhone 12 Pro is designed for our users who want the absolute most from their iPhone. It takes our new design even further with premium materials. This includes a durable and beautiful surgical-grade stainless steel band and precision-milled back glass. They come in four new finishes, including an elegant silver, a rich, deep graphite, a stunning gold and an all-new Pacific Blue. They're engineered with an advanced PVD process that provides a spectacular luster. And our new gold uses a high-power magnetron coating process that gives the stainless steel a stunning bright gold finish. The pro models also feature our incredibly durable Ceramic Shield. And these models have best-in-class water and dust resistance with an IP68 rating, so they can withstand submersion at up to six meters for 30 minutes.

The pro design is complemented beautifully with our new MagSafe accessories which provide easy and secure attachment and high-power charging. iPhone 12 Pro features our industry-leading Super Retina XDR displays. We were able to go from today's 5.8-inch to a much larger 6.1-inch display. And iPhone 12 Pro Max increases from today's 6.5-inch to a more expansive 6.7-inch display. We were able to grow these displays, but keep the form factors nearly identical. So for people who want our biggest displays, this is the largest display ever in an iPhone, with our highest resolution, featuring nearly 3.5 million pixels.

HDR video comes to life. High-resolution HDR movies and TV shows that you stream over 5G will look amazing. Our pro models are packed with pro-level performance. While our competition is scrambling to catch up with our chips from last year, we remain generations ahead. And our advantages go beyond the CPU and GPU. Together with our Image Signal Processor, or ISP, they enable powerful computational photography for camera experiences that simply are not possible with traditional cameras. For example, Deep Fusion uses machine learning on the Neural Engine for pixel-by-pixel processing of photos with unprecedented detail, texture and minimal noise.

To accomplish this, Deep Fusion uses all the compute engines of the A14. Our camera sensor captures multiple images and processes them through the ISP. The CPU computes the alignment of the frames. The GPU pre-processes the images before running them through the Neural Engine. And then there's additional post-

processing done in the GPU. With A14 Bionic, we are able to bring Deep Fusion to all four cameras of iPhone 12 Pro, including the front-facing TrueDepth camera.

We combine state-of-the-art camera hardware with this amazing compute power to create a pro camera system that is unlike any other device. iPhone 12 Pro features our amazing Ultra Wide camera with a 120-degree field of view, and our new wide camera with faster f/1.6 aperture and seven-element lens that let's in 27% more light. iPhone 12 Pro also features a 52-mm telephoto camera for stunning portraits. So iPhone 12 Pro delivers high-quality optical images at three different focal lengths, with a 4x optical zoom range. The larger size of the iPhone 12 Pro Max provided us with an opportunity to do even more with our pro camera system.

And here's Andrew to tell you all about it.

## **Andrew Fernandez**

(Video Presentation)

In iPhone 12 Pro Max, we've been able to create our best camera ever. We have a brand-new Telephoto camera with a 65 mm focal length. Moving from a 52 mm focal length to a 65 mm allows for longer framing in the classic portrait style. With the new Telephoto, you can now optically zoom in 2.5 times for even closer shots or tighter crops, which means improving to a 5x optical zoom range from the Ultra Wide's 13 mm to the Telephoto's 65 mm. iPhone 12 Pro Max features an all-new massive wide camera with an f/1.6 aperture, a new sensor and new system for Optical Image Stabilization, or OIS.

Let me first tell you about the new sensor. It's 47% larger, with 1.7 micron pixels, our largest yet. Larger pixels plus a faster aperture gives iPhone 12 Pro Max an incredible 87% improvement in low light, which is our biggest leap in light gathering capability. On top of that, we developed a completely new system for optical image stabilization that adopts a high-end DSLR approach called sensor-shift. Sensor-shift applies stabilization to the sensor instead of the heavier lens to precisely control motion in X and Y, while maintaining sharpness. This cancels both low and high-frequency disturbances like hand movement or vibrations in a car.

In addition, the OIS on all our wide cameras this year can now make 5,000 micro adjustments per second, which is five times more than last year. Along with motion processing advancements, we get stabilized exposure times of up to two seconds in low light for handheld shots, equal to a full f-stop increase in light gathering. This sensor-shift system is unique to Apple and helps people capture everyday situations with extraordinary images. And it delivers steady video with a truly cinematic feel.

Now here's my colleague Alok to tell you more about another feature we created for our pro users.

## **Alok Deshpande** {BIO 17063023 <GO>}

These are amazing cameras for pros, and we want to give our pros even more control over the images they capture. Many pros love to capture in RAW, but they're missing the benefit of our sophisticated image fusion. So we'd like to show you a sneak peek of a new feature that combines the control of shooting in RAW with the power of our computational photography. And that's Apple ProRAW. This will be an incredible feature for pros and will be available in the iPhone Camera app on iPhone 12 Pro and 12 Pro Max later this year. It provides many of the benefits of our multi-frame image processing and computational photography, like Deep Fusion and Smart HDR, and combines them with the depth and flexibility of a RAW format.

In order to achieve this, we constructed a new pipeline that takes components of the processing we do in our CPU, GPU, ISP and Neural Engine and combines them into a new Deep Image file computed at the time of capture without any shutter delay. And we do this for all four cameras, dynamically adapting for various scenes, while maintaining our intuitive camera experience. Things like sharpening, white balance and tone mapping become instructions rather than being baked into the photo, delivering full creative control over color, detail and dynamic range.

Here you can see a photo shot with Apple ProRAW. Notice how it's taken full advantage of Deep Fusion to capture a wide range of light and shadow from multiple exposures. Because all the data is contained in Apple ProRAW, this image can be processed in various ways, while retaining the crisp, beautifully rendered detail. You can edit Apple ProRAW directly in our Photos app and other professional photo editing apps. We're also creating an API for third-party apps to capture images in Apple ProRAW. This is really the best of both worlds. The flexibility of RAW with the power of Apple's computational photography.

And now, back to Joz.

## **Greg Joswiak** {BIO 3260601 <GO>}

iPhone 12 Pro allows you to take absolutely stunning photos. Even at dusk, you can see the incredible color and texture in the shadows. You can see this Ultra Wide shot preserves the detail in the cracks of the desert floor. You can almost feel it. With Deep Fusion, you can even see the detail of her dress in this low-light setting. In this classic black-and-white, you can feel the sun glistening on the horse. On a tripod, we can take night mode even further, capturing the pop of color in the tent as well as the stars in the night sky.

Now let's talk about pro video. Year after year, iPhone provides the highest quality video on a smartphone. Pros use iPhone to shoot TV shows, news reports and even movies. This has never been more important, as our homes have become our studios. In fact, for many TV productions, from American Idol to Mythic Quest, the show has been able to go on because of iPhone. This year, we're taking pro video further, much further. For the first time, we're bringing HDR video recording to iPhone. You can now record in 10-bit High Dynamic Range. This means we can capture over 700 million colors. That's 60 times more colors than before. While you capture, you get a live preview of your HDR content on the Super Retina XDR

display. And we're also gonna do something that no other device in the world can do.

iPhone 12 Pro is the first camera to record in Dolby Vision HDR. To accomplish this, every single frame of 10-bit video runs through our ISP, generating a histogram and allowing iPhone to grade each frame in Dolby Vision, live while you're recording. And we can do this at 4K resolution and 60 frames per second. This is enabled by our Apple custom sensor and the incredible power of the A14, which does the intense processing of these image algorithms in real time.

Prior to today, you needed a pro studio lab and special equipment to edit your original Dolby Vision footage and then re-encode your files. iPhone 12 Pro will be the first device to edit in Dolby Vision, right from the Photos app. You can even apply filters. iPhone will regenerate the Dolby Vision tuning on the fly. Oscar-winning cinematographer Emmanuel Chivo Lubezki made a film to showcase iPhone 12 Pro with Dolby Vision, and I'd like to show it to you now.

(Video Presentation)

So iPhone is the first and only device that enables you to capture, edit, watch and share Dolby Vision video. What an incredible end-to-end pro video workflow, right from your pocket. And with 5G, sharing your videos from the field has never been faster. And we have another exciting capability we're bringing to our new pro iPhones.

Here's Francesca to tell you more.

**Francesca Sweet** {BIO 19151290 <GO>}

(Music Playing) We've pushed the industry with depth technology over the years, and today we continue that innovation with a LiDAR scanner. LiDAR stands for Light Detection and Ranging, and it measures how long it takes light to reach an object and reflect back. We've adopted this technology for iPhone, and with the machine learning and depth frameworks of iOS 14, iPhone understands the world around you and builds a precise depth map of the scene. It enables object and room scanning, photo and video effects and precise placement of AR objects.

LiDAR makes iPhone 12 Pro a powerful device for delivering instant AR and unlocking endless opportunities in apps. The LiDAR scanner also takes our pro camera system to a whole new level. With LiDAR's ability to see in the dark, we use it for autofocus in low-light scenes, improving accuracy to focus and reducing capture time. Instead of hunting for focus, the LiDAR scanner can identify the subject, focus and capture right away. This works in photos and videos. In fact, with LiDAR, we can improve focus time in low-light scenes by up to six times, so your subject is clearly in focus, without missing the moment. LiDAR also improves depth in low light for night mode, enabling stunning night mode portrait shots like this one. Look at the incredible detail in the face, the realistic color throughout the scene and the



blooming bokeh in the lights in the background. And that's the new LiDAR scanner on iPhone 12 Pro.

Now back to Joz.

### **Greg Joswiak** {BIO 3260601 <GO>}

As you can see, iPhone 12 Pro is loaded with incredible innovations. And when you combine these advanced capabilities with 5G, it will enable you to do so much more on the go. And 5G is going to unlock even more opportunities for our developers. I'd like to show you a couple examples. On-call physicians often need to review complex medical scans anywhere, anytime. OsiriX HD app and 5G enables them to download these very large images with lightning-fast speeds. The ability to download a full diagnostic scan in a matter of seconds versus minutes can make the difference between life and death for a stroke victim. And enterprise will be able to use private 5G networks for high reliability and low-latency apps.

Like JigSpace, which accelerates setup of complex work spaces. To set up a medical device production facility, Medtronic would normally create a Six Sigma cardboard layout of the space, taking weeks to design and costing tens of thousands of dollars. And now, with 5G and the new LiDAR scanner, iPhone 12 Pro enables teams to immediately map the environment and collaborate with their colleagues to instantly place simulated equipment, adapt it to the room layout and outline process flows. JigSpace on iPhone 12 Pro enabled Medtronic to completely transform projects from weeks to hours, reducing costs by more than 90%. We really pushed the limits with iPhone 12 Pro and iPhone 12 Pro Max with stunning new designs and larger displays.

They're packed with our most innovative technologies like the A14 Bionic chip, LiDAR scanner and incredible pro camera system powered by computational photography. And now, here's a short film we created about the iPhone 12 Pro

(Video Presentation).

### **Unidentified Speaker**

A singular new design. A reengineered chip. And 5G. This is iPhone 12 Pro. The vertical band is precision-machined from stainless steel. The Ceramic Shield on the front is tougher than any smartphone glass. And tighter borders allow for even larger Super Retina XDR displays. 5G is set to change the world with radically faster speeds. The hardware and software have been optimized for the best 5G experience. A14 Bionic has a smaller, 5-nanometer transistor, which pushes the most powerful chip in a smartphone generations ahead.

A new and improved pro camera system makes the 12 Pro the photographer's iPhone. The larger iPhone 12 Pro Max pushes these innovations even further. Its bigger sensor dramatically increases the detail captured and helps improve low-light performance by 87%. The custom-designed LiDAR scanner puts advanced depth-mapping technology in your pocket. You can now take a Night mode portrait and

unlock a new world of possibilities for augmented reality. iPhone 12 Pro smashes the benchmark for highest quality video in a smartphone. And the movie industry can now count on it as an essential piece of equipment.

It is the world's first device able to capture, playback and edit 10-bit HDR footage with Dolby Vision. iPhone 12 Pro comes in two sizes and in four finishes, including new Pacific Blue. An integral part of this year's design is MagSafe, an intelligent system of magnets that connect accessories in a whole new way. All this and more make the iPhone 12 Pro the most powerful iPhone ever.

### **Greg Joswiak** {BIO 3260601 <GO>}

Even with all of these incredible pro technologies, we are keeping the price the same as today, with iPhone 12 Pro starting at \$999. And we're doubling the starting capacity to 128 GB. And iPhone 12 Pro Max, with our best cameras ever, at \$1,099. We're rolling out 5G to more than 100 carriers around the world. This is our fastest rollout ever. iPhone 12 and iPhone 12 Pro will be available for pre-order this Friday, October 16th, and available next week on October 23rd. iPhone 12 Pro Max and iPhone 12 Mini will be available for pre-order starting on Friday, November 6th, and they will begin shipping the following week, on November 13th. So this is our new iPhone lineup, starting with iPhone SE at just \$399, and iPhone 11 is now just \$599.

Now back to Tim.

### **Tim Cook** {BIO 14014370 <GO>}

(Video Presentation)

Wow, what an amazing day. This is the day we've all been looking forward to. It's remarkable to think about where iPhone started and where it is today. Now with support for high-performance 5G networks, the powerhouse A14 chip, Super Retina XDR displays with Ceramic Shield, MagSafe and breakthrough camera systems that even record Dolby Vision video. And pro models that take the experience further with a pro design, four incredible cameras, LiDAR scanner and the largest display we've ever shipped in an iPhone.

We've come so far with a device that is so important to our daily lives. This marks the start of a new era for iPhone. And we announced HomePod Mini, with computational audio, the power of Siri, and a simple and private smart home experience all in a beautiful, compact design. At Apple, we put the user at the center of everything we do. It means so much to us to create products that make a difference in people's lives. Products that make things simpler, easier and more enjoyable. And we couldn't be more proud of these products and the amazing teams who made it all possible.

Thank you for joining us, stay safe, and have a great day.

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