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Investor Meeting

Company Participants

- Unverified Participant
- Kyushik Hong

Other Participants

- Mark Newman
- Shawn Kim
- Claire Kim

MANAGEMENT DISCUSSION SECTION

Unverified Participant

Good afternoon, everyone. No response. Welcome to the Samsung Investor Forum 2015. My name is [ph] Jong-Min Kim (00:12) from Samsung IR team. It is great to see you all in Singapore, a warm and rainy day. It's my honor to host to you to our event. As you may know, we usually organize the investor forum twice a year. This is the second one over this year. Our investor forum is focused on specific technologies and solvencies to provide investors some insights of industry trend and our view about them. So, we will not be providing our business performance or specific earnings items such as cash flow or share buyback something like that today.

Like the previous Samsung Investor Forum, today, we prepared three sessions which we believe will contain various interesting subject. The first session is called innovation for the next mobile experience. And it will be presented by Dr. Kyushik Hong from Samsung Electronics System LSI. He received his PhD in Electronic Engineering at University of Michigan and Harvard. In his position as a mobile solution provider, he will further discuss Samsung's differentiated technologies and strategies is System LSI, including mobile [indiscernible] (01:53) image sensor, bio-processor, et cetera.

The next presentation is about enterprise mobility and beyond. As the growth of smartphone market is [indiscernible] (02:08). It will be considered the world's next growth driver in smartphone business. Dr. Injong Rhee, Head of Mobile B2B R&D team will talk about the mobile B2B market trend and Samsung's strategy and continuous innovation regarding [indiscernible] (02:29) platform and Samsung Pay, even about Connected Car.

Many of you probably know Dr. Rhee since he was invited as a speaker at the previous forum in Seoul this year. He is a professor of Computer Science at North Carolina State University and currently, he's working for Samsung Electronics. [indiscernible] (02:54) responsible for inventing and commercializing the Samsung Enterprise Solution, including Samsung [indiscernible] (03:02) platform and Samsung Pay.

[ph] The last section (03:07) is about innovation drivers for the future. The presenter, Mark Bernstein is currently our Senior VP of Samsung Research America. Prior to joining Samsung, Mark led the Palo Alto Research Center as the CEO from 2001 to 2011. In his presentation, we can hear about why Samsung Research America is working on regarding various technology trends and innovation.

I believe that he will provide unique and differentiated approaches in terms of both advanced software and hardware platform to deliver Samsung's signature experience. I am sure that these speakers will provide you with very unique and exciting stories about our businesses and strategies that most of you have great interest in. I truly hope that you

enjoy this event. Please note that during today's presentation, we may make some forward-looking statement related to our expectations and other future events which may differ materially from Samsung Electronics actual results.

Thank you and to kick off today's event, please join me in welcoming Dr. Kyushik Hong. Can you give him a big hand.

Kyushik Hong

Thank you. Good afternoon, everyone. My name is Kyushik Hong from Samsung Semiconductor System LSI Business. And today, I'd like to take a few moments of your time to walk you through some of our stories. Also share with the innovation in semiconductor, which is being underway to bring all levels to the next level of mobile experience.

Okay. First, we all know these gadgets, the mobile devices and we call this smartphone, but they are not just smartphones because we do far more things with these devices which is much beyond what a phone is supposed to offer. And in these days, we all know that we mainly browse the Web with these smartphones, and of course, we play games and we take photo, and we create many form of arts like in music and graphics and in movie. And the smartphone has become the – a hub for the variety of peripheral devices like the many wearable in many different [ph] form factor (06:12) with which we can hear our body talk. And more importantly, we connect to the society using our many – our social network services using the smartphone. And in these days, one – even like a one normal person can impact the whole society, thanks to the social network.

There's some recent research conducted for the U.S. consumers, which shows that the average time that people spend on these so-called digital media already surpassed the traditional time they spend on TV. And this is thanks to the rapidly growing digital time for the mobile devices. So, within the strategical time, people also spend more time with the mobile devices like smartphone and tablet rather than traditional desktop PC or laptops.

So, we are indeed so-called in a Homo mobilicus. The way we think, the way we behave and probably the way we interact with each other is quite different now, thanks to this device. But the mobile device was not like this from the beginning. And probably some of you probably remember when it first hit the market almost 30 years ago, it looks quite different. And at the time, people expected the maximum number of mobile subscriber by 2000 couldn't be more than 1 million and which turned out to be massively wrong by more than two orders of magnitude. So probably at this time with this type of front probably then made sense because not many people can afford and can pay like KRW 4,000 for just a one hour of talk time.

And we know that since then there has been great evolution in the mobile devices. And thanks to the innovation from all different aspects of technology associated with this great device. So as you can see, the clock space for the CPU and number of pixels for your display and the number of pixels for the camera has been growing tremendously for last like 20 years or so.

And this is again thanks to the innovation from all aspects of technology and there is no doubt that the semiconductor has been always been the center of this innovation. So we've been coping with a lot of challenges and technical – the paradox for the mobile device evolution.

For example, people want high performance CPU and GPU, and they want larger display, but they don't want to compromise your battery life. They still want a longer battery life which doesn't coexist without any kind of innovation.

And as for the camera, people want higher resolution and brighter image. And naturally, that requires the bigger pixels to capture more light into the single pixel. But still with need to accommodate this immediate sensor into very small compactor so that it can comfortably tuck into very sleek and the slim phone design in these days.

So there is such kind of a paradox that we have to deal with. And we've been tackling these [ph] paradox (09:52) through the continuous innovation in semiconductor technology in terms of process technology and in terms of even architecture technology. And now, Samsung can offer the whole suite of semiconductor solutions for the mobile device, as you can see from the power management IC and driver ICs and NFCs and SIM cards, and wireless

connectivity.

So, with the limited time that I have today, let me just focus on just three product groups. The first one is the mobile SoC and second one is the image sensor. And then I also very briefly touch upon the new type of device that we have just introduced, which is the bioprocessor.

Okay. So, let's start first with the mobile SoC. The mobile SoC, sometimes also known as application processor, is indeed the brain of the smartphone. It is really the central control power that controls all the functionality of the smartphone. And we also take – and also be responsible for heavy-duty – the [ph] computation (11:09) of workload also by itself.

So, if you look at the workload required for this mobile SoC, in this phase the entertainment category is really the predominant factor that requires the high performance followed by socials and web and et cetera. Now, this is because this entertainment application that really requires best, the power to handle the multimedia like a very high graphic for the games and very high resolution in a video playing. And if you look at the trends [indiscernible] (11:55) for smartphone in these days, it's quite simple. People want bigger screen. As you know, most of the smartphones is more than 5-inch in these days. And they want higher resolution for the – a clear picture on the screen, so you can easily find WQHD level of screen in these days.

And for the camera, again, people want higher resolution so that they can take more clear, high-quality picture. And also, at the same time, the high-quality image even at a low light situation. And then the phone itself is not UHD, but people still want to record [ph] 4K (12:39) which is great, the image video and also the capability of playback, the UHD image using this smartphone. And then the seamless streaming from the NAND is, again, very important because there are so many real-time cloud-based, the services available in these days.

And if you look at this, this is all about the media and all about the multimedia. So, all these are new requirement, and the way we use this phone is very closely related to all these multimedia functions.

So, in order to use the smartphone as long as we want, I mean, for the longer battery life, you have to very carefully tackle the performance and the power at the same time. So, this is kind of a new paradigm for the mobile SSD. So, for example, when a phone was just a phone to make a phone call, the key performance index at the time was – is like a long standby time. And then long standby time is determined by static power of the semiconductor which is like [ph] trends (13:56) for leakages, when [ph] trend is (13:58) not really working, so they kind of in a standby mode as long as they can so that they don't miss the next coming calls.

But, in this case, it's quite different now, and so we do more care about the dynamic power [ph] residence (14:14) static power, and dynamic power is the power that [ph] changes that consumes (14:18) when it is really absolutely working. So again, in order to prolong the battery life we have to find a way to maximize the performance which naturally requires the energy, so at this time, same time, we have to minimize the power required to perform such as high performance. And this hasn't been – this is not really the possible in the normal trade-off, so that's why we always need some kind of innovated approach to overcome this kind of a paradox situation.

So, Samsung has been trying to make some breakthrough for this kind of a situation. So, we first introduced the high-K metal gate, the transistor in our [indiscernible] (15:20) the product line and in which we broadly replace in most sensitive material in semiconductor technology which is actually the gate dielectric and gate electrode with a high-K and metal gate material and [indiscernible] (15:39) we introduced the industry's first, big little octa-core the processor in which at what load can be raised mostly distributed between the four big cores and four leader cores. And earlier this year, we also introduced a world first mobile processor based on 14-nanometer FinFET 3D transistor. And here, what you see is the one that we announced last week which is Exynos 8, which is a yet another innovative product we introduced based on our own custom CPU as playing as like a big core along with four [ph] A53 leader cores (16:27). And especially in this product, we also monolithically integrated state-of-the-art modem which can support category [ph] 4 (16:41) and category [ph] 13 (16:41) which can allow us up to 600 megabit per second downlink speed and 150 negative per second uplink speed. And this is all done on our advanced second generation 14-nanometer FinFET technology.

And while this particular product is smartly tailored to target premium segment of smartphone, we also have a whole line of a product which can cover the mid-range and low-end, the smartphone, so, that more and more people can enjoy the benefit of this great – how advanced [indiscernible] (17:26) we have achieved.

Okay. So, the innovation in mobile, as you see, is ongoing and via this innovation, we truly believe we can help people capture the immersive multimedia experience for as many people possible.

Now, I just move onto the next product line, which is the images sensor. Let me just start with some words that we are all very familiar with, which is a photograph. A photograph, we're very familiar with this. Ever since we started carrying this little device wherever we go to take the photos whenever we want, and actually, the word photograph is a combination of two words. The first one is photo, meaning light. And the second one is graph, which means drawing. So, basically, this is capture the light and recreate the light so that we can keep just for ourselves, for example. And also, we can share with other people.

And, we believe it is really a deep-rooted human desire to record our daily life and share with other people. And even though people lived 20,000 years ago, they really tried in a hard way to record their daily lives and to share their lives with others. And after 20,000 years later, now, we humans can capture the light whenever we need. And we can create the light whenever we want. Thanks to this modern technology.

And Samsung System LSI can offer the end-to-end solution to capture the light into the digital world, and recreate the light by transforming back to the analog world with our images and the technology, and our display driver IC technology, respectively. But today, I'll just focus on the first part of the process which is the Samsung's Image Sensor Technology. Now, people say that more than 2 billion people in worldwide is using the smartphone. And if you ask them what they use their smartphone for, taking photo and sharing the photo is always on the top of the list, and this is regardless of the region and age group or in any society.

So, sometimes we say that we probably call this device as like smart camera with which we can make a phone call rather than smartphone with which we can take photo. And when you look at the resolution of the smartphone camera, it already surpassed the resolution of a traditional digital still camera and it is not just the resolution. The quality of the smartphone camera has improved a lot as can be seen here in terms of DxOMark, the score. So, during the last five years or so, the score has increased tremendously. And if you look at the older category that we analyzed in this case, it's not just the picture quality but all the functionality like auto focus, that kind of a functionality also has improved a lot.

So, this kind of divestment in the smartphone camera has affected the way we behave and even the way we communicate with each other, and today, people say that more than 808 billion photos are uploaded into the network and – which is the 2.4 billion for every day. And, for example, like Facebook alone, there is more than like 250 billion photos are being uploaded there every year. So, somehow, why people upload those photos to the network and that's just to share this photo with their loved ones. So, this kind of advancement in the technology somehow affected the way that we behave in our daily lives. So, even some new words and some new device has been invented.

The selfie, the Oxford Dictionary, they always select the word of the year every year, and two years ago in 2013, they picked the selfie as the word of the year. And last year, the TIME Magazine selected the selfie stick as the best invention of the year. And I think they really deserve it.

So, here's some – the challenge for the camera because the smartphone itself is getting slimmer and slimmer. It's like five years ago, it's the ones like the – almost like 1-centimeter thick. Now you can easily find the smartphones which is they're 5-millimeter. And that imposes a lot of technical challenges for the camera makers like Samsung, because the trends clearly say that it's got to be slim and they still want a very detailed picture. That means higher resolution as we can easily see like 16-megapixel camera or even 20 – more than 20-megapixel camera in these days. But they also want to have a very bright picture even at very low light condition. And that actually requires a bigger pixel. So, it just doesn't make sense to meet all this kind of requirements and it's got to be fast. So, fast autofocus is also very important.

So basically, to me, and all this kind of geometrical constraint, you have to make your pixel as small as possible but that means you capture less and less light into the pixel. So, you probably need to compromise the picture quality. But

that's not what the people want. So, you have to, at least, keep the same picture quality but you have to keep shrinking your pixel size so that you can have the same or higher resolution with the same geometry or you can have a much smaller phone factor with the same resolution.

So somehow, our answer to this seemingly unfair requirement from the market is ISOCELL. We introduced this technology a couple of years ago. And basically, it really revolutionized the way that we design our images and pixel.

So, just for those – I'm not really familiar with the images sensor, actually, this is an array of the small pixel responsible for red or green or blue, the color component for the picture. So, ideally, all the lights that goes into the red window, for example, that has to generate all the electron within the red cell and that electron has to be collected into the circuitry as the red signal.

But as the pixel size shrinks, there is a lot of kind of the cross [indiscernible] (25:32) between adjacent cells. So, the light goes into the red cell probably creates some photons in the blue cell. And they're collected as like a blue signal that kind of distorts the image quality from the beginning. So, we should find a way to make it as ideal as possible. And the simple [indiscernible] (26:01) simple answer is just to separate each cell. And that's the whole idea behind the ISOCELL. So, as you can see from this picture, we actually put a wall, between all these tiny pixels, so that all the light goes into blue cell, for example, is contained within the blue cell as much as possible.

And this is a possible – only through the very advanced processed technology that we internally developed inside the Samsung. We just [ph] can't (26:40) take advantage of this kind of innovative approach in many different aspect. So, let me just introduce and show some of these aspects from [ph] now (26:50). So, one 1.0 micron pixel, that's actually the smallest pixel in production in the space. And traditionally, it's been a little bit of the previous version was a 1.12 micron. And now, we were able to reduce it down to 1.0 micron, thanks to this ISOCELL technology.

And but if you are using the same 16-megapixel of the camera by employing 1.0-micron pixel rather than 1.12, you can reduce the whole module thickness from, let's say, 6-millimeter down to 5-millimeter, is close to 20% reduction in terms of the thickness, which really matters in this kind of a thin and slim trends as we've seen in the smartphone field. And next example is a bright cell. Bright cell is a trademark, the piece of technology which replaced all these traditional – the green pixel in the RGD, a value pattern with a white pixel.

So, in this way, you can collect more light. So, even at a low-light – the environment, you can take much brighter picture by replacing this green pixel with a white pixel. But if there's no such kind of a good separation in between pixels, there is a lot of [indiscernible] (28:23) so you cannot reconstruct the green signal as you want. So, again, the ISOCELL technology is behind this bright cell technology which allowed us to replace the green pixel with white pixel for the much brighter picture without compromising any picture quality.

And Smart WDR, which stands for the wide dynamic range, is another example. So, when we take a picture in the left side, for example, there is like a dark spot and a very bright part. And you just expose yourself per unit from across the pixel, you have to focus on just one of them. So, when you focus picture exposure based on the dark side. Then bright side became just too bright and the vice versa. So, there is some smart way to control it so that you can take a good quality of image from the dark side of the – dark part of the picture, as well as the bright part of the picture. And that's a smart – the wide dynamic range that we introduced. So, basically, adjacent pixels, we can control the different exposure time from one pixel to the next pixel just as sitting next to it. And again, without a good separation between these two, you cannot fully take advantage of that kind of smart WDR. And thanks to our innovated ISOCELL technology we were very successfully demonstrated the smart WDR.

And one last thing associated with this is the very fast auto focus. So, when you take a picture of very fast moving object, definitely you want to capture this object with just a perfect focus. And the conventional way to do it is whether [indiscernible] (30:34) way just relying on the contrast of the image. So, that surely takes time. But with this new PDAF which is a face-detection auto focus technique, you can just capture the focus instantly without any such kind of reiteration. So, the auto focus time can be reduced dramatically. And this is done by left and right pixels sitting next to each other, but by minimizing the cross in between, again, thanks to this ISOCELL technology.

Well, we know that this [indiscernible] (31:24), he's one of the famous, prominent photographer in our time and we always say that the photography is all about capture the decisive moment and with all this technology that we just introduced, we're pretty sure that we can help people to capture the decisive moment of our life without a better – I mean with a better picture quality than ever before.

Okay. So, now, let's move on to our last topic and I will just briefly touch upon some of the innovation that we have done on this device on wearable area. Actually, the wearable device is kind of [ph] a buzzword (32:20) in this space. And we also expect the number of wearable device will explode in the next couple of years, and this is also based on the assumption that there will be a technical innovation to drive this kind of new explosion.

And if you ask people what they want to do with these wearable devices, health and fitness is always on the top list. And I think probably this is a quite natural because the health and fitness is always the – a bit concern in the interest for all human being. And in order to take advantage of our wearable devices which we carry all the time, probably the health and fitness is the probably the best solution we can get out of it.

So, the requirements for this wearable. It's quite simple because the form factor is [ph] probably small (33:32), so the older component that goes into this device should be very small and very tiny so that it doesn't actually occupy a lot of space in these wearable devices. And at the same time, because the size of the battery cannot be big in this very limited room again, so the low power consumption is also very important.

So, recently, we have introduced probably the industry's first highly integrated bioprocessor and in this case, we integrated a lot of different functions into one single monolithic chip. And for example, you can do the hot grade measurement using this traditional photoplethysmogram and electrocardiogram and body fat measurement with a bioelectric impedance analysis, and also you can do galvanic skin response with which we can actually measure the emotional status of the people, not just the physical status. And the skin temperature sensor is also integrated.

So, compared to the case where all these functions should be created with the different component, we can actually reduce the [indiscernible] (34:58) size by 80%, and which helps a lot for this limited the space for the wearable devices. And the application for the biosensor is not just limited to health monitoring or fitness. Once we made this kind of breakthrough to make it such a simple and tiny form factor, thanks to our 45-nanometer embedded flash technology. There has been a lot of inquiry from all the different industry and some of them is something we even didn't expected. For example, the game industry is very interesting in this biosensor because if they want to incorporate this kind of a sensor into their next game which can incorporate some kind of a biofeedback into the game scenario.

And even though auto industry is very keen on this type of biosensor because the driver's physical and mental status monitoring is very critical for the auto industry as well. So, the biosensor market is just starting but we are quite excited to see this limitless possibility that this biosensor will bring to us.

And as I mentioned that once we made this breakthrough, there is a lot of people jumping in to this innovation from all different aspects and some of them is something even we didn't expected, so I think when we just keep moving on to make more smaller and let's – the consuming bio-processor, definitely this innovation will help capture the healthier life for everyone.

Okay. So, I'll just talk about some of our value proposition. So, the Samsung System LSI, we provide the most expensive mobile product portfolio, and as I just introduced some of them like mobile [indiscernible] (37:19) and Image Sensors and Bio-Processor but we do have a much more, and they are now working independently. They'd rather work in perfect harmony to globally optimize the performance of the device, so that we can maximize the mobile experience for the user. So I think we have all this advantage to take the synergy in between the circumference, so that the – we can really provide the best solution to the market.

And adding to our in-house manufacturing capability and capacity, and all the in-house developed process technology that I introduced like 14 nanometer technology, FinFET technology and high-K metal gate technology and ISOCELL technology and embedded flash technology for biosensor, this is all developed internally to optimize the product in terms of the product side and the process side at the same time. And we can truly provide a total semiconductor solution to enable the next level of mobile experience.

Okay. So, that's it for today. So I would like to invite everyone to join our exciting journey to enrich our daily life through this everlasting innovation in semiconductor. Okay. Thank you.

Q&A

<A>: If you have any question, please raise your hand or bring the microphone to you.

<Q - Mark Newman>: Hi. Mark Newman from Bernstein. I'd like to ask about the biochip business. How close to commercialization are you for the bio-chips? Just like to understand when might it be meaningful revenue generative for Samsung? And is the goal to sell it only to Samsung devices or also to sell externally?

<A>: So, the question is commercialization plan for the bio process, right? Actually, as I said, there are a lot interests from all different types of industry. And we believe the first commercial product employing our biosensor will be the markets some time only next year, probably the Q1 next year that as we understand and that's not from the Samsung device, right.

So, as I stated, not like the smartphone or wearable, there are a whole different industry which can very creatively adopt this technology into whatever interest they have. Well, frankly, I haven't seen the final product yet but I think it's probably something close to the band or the smart watch type of application. More tailored to some kind of activity, kind of application.

<Q>: [indiscernible] (41:08). There was a slide briefly showing the virtual reality on glass. I wonder from Samsung [indiscernible] (41:18) MSI's perspective, what can you bring to the table? I understand that that's indiscernible] (41:26) Samsung has been relying on the [ph] Mali (41:30) structure, but is Samsung also trying to do something on its own there because obviously [ph] VI is very TPU-heavy (41:38).

<A>: I see. So, let's say, so there are a different type of virtual reality device, as you know, right? The first version of Samsung Gear is [indiscernible] (41:51) for using the smartphone as the screen. But there are a lot of [indiscernible] (41:57) from the industry, which is trying to apply its own dedicated display. So, probably the one reason is – I actually mentioned the UHD type of – the playback requirements. But for the normal – the smartphone, I don't know whether we really need UHD-type of screen, but for the virtual reality, definitely it helps.

So, in order to maximize the kind of experience, probably there are some market, which requires that [indiscernible] (42:36) to screen. I mean, it depends on the market for the virtual reality. So, one of the things that we are working on is to make, for example – I didn't introduce our display driver IC, but in that case that kind of very high resolution specialize in screen for the virtual reality.

The display driver IC are placed – are quite evolved, and that's actually the one area that we're looking for. And as you say that the processing power from the GPU or whatever the processor that goes into the virtual reality, it's also very important, and that's for sure. But in these days, most of this very high-end flagship premium type of SSD processor can handle the kind of workload more or less. But as I say, if you really want to push the limit, we probably need to have some more like specialized processing for that field.

<Q>: Okay.

<Q>: Thank you. Great presentation. My name is [ph] Simon Oh (43:51) from Bank of America. I have two questions. One is what's your solution idea for the overall smartphone solution?

<A>: Okay.

<Q>: Second one is, today, your presentation overall is semiconductor chips. That means we have to think about the Moore's Law [indiscernible] (44:07) trend. So, first, the question regarding the one-chip solution. For me, I have a lot of a different opinion regarding the high-end phones which really requires stand-alone [indiscernible] (44:16) very powerful continuously. Meanwhile, the [ph] modem chip, biochip (44:21) require maybe low-end technology.

So, my question is, sometimes you only want to focus on the one-chip solution implementing very expensive [indiscernible] (44:31) technologies to cover all the functions? This is maybe my first question. So, my suggestion is, for the high-end phones, I really recommend that maybe each chip must [indiscernible] (44:40) CPU [indiscernible] (44:43) CPU rather than adding the modem chip. That is my question.

And second, in Moore's Law, when we look at the memory chip or even the [indiscernible] (44:51) CPU every 18 months to 24 months to make us introduce new technology more to make a chip size of small [indiscernible] (44:58). So, my question is to you, will you want to focus on that kind of strategy for your [ph] biosensor (45:03) chip everywhere putting the new technology [indiscernible] (45:06) to make the chip more cost competitive? Thank you.

<A>: Okay. That's a very good questions that we are always seeking the answers for ourselves as well. And – I mean, let me answer the first question first. And so, this is single chip approach. I think it really depends on the technical trend. For example, couple of years ago, application process aside, evolves very quickly, right, like an interface phase peg is changing every year, for example, but while the modem side is already conservative, there's no such kind of frequent cadence required for the modem side.

So, when the cycle of technology evolvement is different then I think that you need a separate chip, right? So, you have a separate modem and separate AP to – and that should be probably the optimum solution for you. But, at certain times, when you can merge this two, definitely there is some benefit. Not just a benefit for the board space, but you can actually, how can I say this, optimize the interaction between the AP and modem. So, the overall like performance and power consumption, things like that, should be minimized. So, there is definitely some benefit, when you integrated those two chips into one.

But, I don't say that that's always true. I think we do have all the options. We very carefully watch how the technology evolve. For example, if the modem evolves faster than the AP then probably we need to separate the two chips again to catch up this fast evolving technology for the modem side. So, I think we are pretty open and the good important thing is we have both solutions in our hands. So, it depends on the situation and the market requirements and the cadence of the technology involvement. I think we can optimize whatever the best solution to serve the market.

And as for your second question, the more slow – whether we really need to keep shrinking the bioprocessor, things like that, I don't think the answer is a yes. I totally agree with you. And for a certain chip, for example, the one that really requires insatiable performance with the low power, probably there's some benefit why does it keep shrinking the geometry. But like a bioprocessor, I don't think you need more than 45-nanometer. And even after we create all the markets the concepts, probably we can even step back to bigger geometry if then makes sense.

So, I think that's one of the advantage that we have because we still carry a lot of different technology generation starting like 14-nanometer for such a high performance chip, all the way up to like 130-nanometer technology, which is used for let's say display drive IC and like all the power management IC, because they really need to put some power, right? So, there is no point we shrink those products.

So, those products are still using 130-nanometer technology, for example. So, we have all these kinds of suite of technology on the production. So again, whenever it makes sense for the market and for the customer, I think we can pick the right technology for the right product.

<Q>: [indiscernible] (49:19) Canadian Pension. Mr. Hong, you mentioned under value proposition, you have eight extensive products. May I know how many percent of your business is from Samsung? How many percentage from non-Samsung? The second question is on average non-Samsung clients, how many of those products are they buying from you? And that question would be how does a competitor view buying components from you from Samsung [ph] competitor (49:46)?

<A>: You're talking about the Exynos mobile processor, right?

<Q>: Yes. On all of those extensive products, yes. Image sensor, power IC, Exynos, everything.

<A>: Oh, I see. As I stated, we have this full suite of semiconductor solutions over mobile. And so as a component provider, basically, you need to find the biggest customer in the world, right? And for us, you happen to get Samsung

mobile because as we all know, the Samsung mobile is the biggest smartphone-maker in the world. So in that way, I think we're kind of very lucky, right because we have this big customer somehow inside Samsung.

But as you know there is no such guarantee that Samsung mobile can always use the components from Samsung, right? If there is no reason to use, that's it. But from our side, in respect to your question, we pretty much focus on the number one customer. They happen to be Samsung, but whatever the customer that carries the volume will be our biggest customer at any time, I believe. So it depends on the product group. Our main customer can change and the percentage of our product that goes to – outside of Samsung varies. So, for example, like the Exynos type of mobile as you see. We pretty much focus on the Samsung Mobile and – so that because – as I said that we introduced a lot of the new lineups for the mid-range and low-end and stuff. And we try to focus on this – our number one customer at this point.

But for some other product like image sensor, we have a number one market share in China market, for example. So, we sell a lot of our image sensor in all the Chinese OEMs.

<Q>: So will Samsung be majority of your business for a lot of all these components as of now? Like 60%, 70%, 80% or [indiscernible] (52:18)?

<A>: Right. So as for the – our internal product that I presented, I mean, naturally they are the biggest market in the world, so naturally that's our biggest customer for us as well.

<Q>: Hi. Charlie [indiscernible] (52:37) from [indiscernible] (52:37). Are you guys working on a CMOS sensor for your camera? And if so, what's the timeframe?

<A>: Oh, I see. So dual camera is also very hot in opposed to [indiscernible] (52:50) in these days, right? And we are also very excited to see these kind of new trends coming. But I said, the camera sensor maker, the dual camera definitely will increase the number of camera sensor market. So we very carefully watch and we tried to very proactively developed dual camera solutions from our sensor side, as well as our SoC side because many of the dual camera – the value proposition has to come from the SoC side as well.

So, what I can say is we can very actively work on it, again from the sensor side and from the SoC side as well, pretty much separately and we do have some prototypes. But I mean when this dual camera will be employed in the final phone. I think that that really depends on our customer. So, I cannot just speak for them, but we are working with many customers to develop this kind of dual cameras. So, when there's a refinement for the market, I think we'll be ready.

Well, as you know, there are always some dual camera, the phones are available in this phase, right? It's very limited now. So, I don't know whether it will be really the mainstream by next year, I'm little bit doubt about it, but that's [indiscernible] (54:27) you just see more and more of smartphones with a dual camera next year.

<Q>: My name is [indiscernible] (54:38) Management. I have two questions related to your AP business. First one is I think before [indiscernible] (54:51) I believe our market share at our captive customer especially on the high-end phone wasn't that high. And from [indiscernible] (55:02), we had made a significant development. I guess that's from last year. Could you tell us if there was any major breakthrough within your Exynos business or what was the major change and what was the major success factor that you could gain more market share? That's the first one.

And second one, if you could comment on your packaging technology? And I think fan-in, fan-out, some comments on that would be very helpful.

<A>: Okay. So, as for the first question, I think, frankly, it's kind of hooked to our customers. So, I don't know the exact reason why the market share changes. But, as I mentioned, that we just keep introducing the new technology to the market. And definitely this 14-nanometer technology that we pioneered in the industry, I think definitely that helps to – for us to increase our market share in this – the captive customers. But it's a little ways off to the – that our customer would determine the market share portion, and there's a lot of aspects they consider as far as I know. So, I can just speak for them, but technology-wise and there's a lot of different aspects, there should be a firm reason why it changes from time to time.

But what I can say is that since the 14-nanometer technology gained pretty position and I think we'll continue a very strong position not within our captive but any other market that requires this advanced technology.

And on the second question is about the package, right? The package is also one of the value proposition that we can probably [indiscernible] (57:06). As I say that we have all the internal products and we have the internal fab and process technology and this [indiscernible (57:18) technology has been always the center of the semiconductor technology as well.

So, as you know that we once pioneered this laser drill-based, the PoP technology, and now, there is a new trend for the fan-out WLP-type of technology, and I think that we are pretty ready to match whatever the requirement from the market. So, for example, [indiscernible] (57:54) PoP – the base packaging technology, we do believe at least in the near future, you can meet all the requirements in terms of thickness and whatever the performance in the requirement and even at the lower manufacturing cost.

So, we're flexible in the different type of packaging options, and again, we are ready to provide whatever the best option for the market, to meet the market's requirements.

<Q>: [ph] Jason (58:35) from [indiscernible] (58:34). Can you please comment on [indiscernible] (58:38) how your image sensor technology compares to one of your Japanese competitors, and for the image sensor, besides mobile, what areas are you focusing on and how do you see your business penetrating into the mobile side? Thank you.

<A>: Okay. So, I think for image sensor technology innovation. It has to come from, I mean – in large probably has to come from the process technology. So, having you around fab and you around process – I mean, the pixel process technology this is very important. So, I think that's not some fables, the base, the image sensor company can do.

But particular company that you mentioned, a Japanese company, they also have their own process technology to develop the pixel quality. So, in that sense, I think we are pretty much on par. But the one we have in addition to that is we also have very advanced logic technology as well. And probably you know that all the advanced image sensor is now all this [ph] packed (59:56) sensor. So, meaning that [indiscernible] (59:58) part of the sensor is surely the pixel and you put all this kind of logics that can handle all the immediate processing, stuff like that, into the separate dedicated logic chip and you just stack them together and these are too part of the sensor can work in perfect harmony as well.

So, Samsung, I think, one of the advantage we do have is that we do have both pixel [ph] in-house (01:00:27) pixel technology, as well as advanced logic technology as well. So that we can stack them together by taking advantage of the synergy between this technology.

And I think the second question is about the application outside the mobile, right? So, that's definitely another very exciting subject. Today's subject is about mobile, so I'm pretty much focused on mobile application. But we do have – we do see a lot of opportunity in other applications as well. And automotive is one clear example and, again, combining some of the processing power that we can provide.

So, for example, like automotive, like – there could be like 16 images sensors that has to be working at the same time, and you can't – you have to handle all of this kind of – the video images at the same time for very sophisticated [indiscernible] (01:01:33) type of automotive application.

So, definitely automotive is one area. And there could be a lot of even consumer electronics area. Like in this case, even this robot [indiscernible] (01:01:49) they have some imaging sensors inside. So, we're constantly looking at some other opportunity. And we believe all the technology that we built upon the mobile device will greatly help to – for us to expand our area outside the mobile.

<Q>: [indiscernible] (01:02:19). On the 8890, is part of the approach to your captive customer, using this road map because of the monolithic chip, does it give sort of a bill of materials advantage? And so, is this product going to be targeted mainly at the low to mid end of the smartphone market?

<A>: This idea, that's a stick – Exynos 8890. That's targeted for the premium segment, the smartphone, right, and that's actually – I mean, we carefully tailored for that market. Within that portion of the premium market, we shouldn't necessarily expect a multitude of solutions in terms of the high-end SKUs. So in your new view, it's going to be mainly monolithic die.

<A>: You mean from the customer point of view or -

<Q>: Yeah.

<A>: So on the – I'm probably unable to speak for the customer side, but as I say, that's – there's a great benefit for the monolithically integrated modem and the AP. And the Exynos 8 was the first [indiscernible] (01:03:37) from the Samsung side for the premium segment. We do have such kind of the integrated chip with the low-end segment before, and which already under production. But for the premium segment, that was our first attempt and we kind of probably announced that just a couple of days ago.

<Q>: Just one more. Just in terms of our roadmap from a process technology perspective, can you maybe just comment on how far your roadmap extends and any initial thoughts on beyond 14-nanometer?

<A>: Well, we talked about some Moore's law before. But definitely, there's some benefit at next level, like 10-nanometer and even with – we're working on some development for the 7-nanometer [indiscernible] (01:04:26). But in terms of when it will be the mainstream, I think it really depends on the requirements from the market. We just try to be ready whenever it comes to time for such kind of advanced technology.

Okay. Time's up. I think we can move on to the next speaker.

Yes.

Okay.

Give him a big hand, please. Thank you, [indiscernible] (01:04:58).

Unverified Participant

Okay. Please welcome [indiscernible] (01:05:15) at the stage with a big hand.

Unverified Participant

All right. I come here every three months. Many of my presentations I think there's nothing so much new about this one, but I think always happy to update with our progress in the B2B and also new service area that we actually just recently launched, and of course Samsung Pay. And so, today I'm going to really talk more about – instead of Samsung [indiscernible] (01:06:03), more about the enterprise, our enterprise market strategy. And my name is [ph] In-Yong Rhee (01:06:09). I'm in charge of the Samsung Global Enterprise Business. That's including R&D and on the sales and marketing functions [indiscernible] (01:06:24).

So, if you look at the market forecast, the overall, you can actually see that the gross is about – [ph] the CAGR (01:06:38) is about 4%. But one thing you can notice is on a B2C side it's only 1% increase. Market is getting a saturation. On a B2B actually you're seeing – we're seeing about very strong growth, right. So, that's – a lot of this growth in the mobile and handset business, smartphone business, smart device, mobile tablet and things like that. A lot

of them actually, the growth is attributed to the enterprise side.

Here we're seeing about $600 million smartphone devices usually in the enterprise and also half of them actually using that device, along with their own mobile applications and also this one is expected to grow. So, not just in the mobile handset, it's also into the Internet of Things. A lot of enterprise application you're expecting to see then the number of devices that you can expect there is more than 10 times.

So, key challenges in the enterprise. First is the security, right. So, when you store your enterprise data and will apply the enterprise solutions on the device, first thing you care about is whether that data is safe, right? When you lose the device or when user [indiscernible] (01:08:21) downloading a malware and the application with a malware it has the ability to take your sensitive information and then send it to some offsite. And those kind of protection data linkage protection is a key concern.

And number two is that the data management, right. Not the data device management side, okay or sometimes actually moves in the application management side, right. So, when it comes to the device management it's actually talking about whether you can [ph] remote-wipe (01:08:56) the device when you lose the device, and also you can disable certain functionalities like Wi-Fi or some of the key connectivity functions of the mobile device. And then also, there is a lot of certificate managements to make sure that devices with certificate users, with the right credentials you can connect into company network. And those kind of devices that management also the application management whether you can – users are allowed to download only company's certified applications and software.

So, at the same time, lot of actually the trends we're seeing is bring your own device, and some people call it bring your own [indiscernible] (01:09:45). You have to be very careful about when you're actually allowing users [indiscernible] (01:09:59) to bring that device to workplace connecting into the company network and start using the applications and software then its liabilities and lot of this compliance issues related to protecting users, actually that your employees' privacy, at the same time, also being – this device being owned by the employees that are owned by the employer. Then you cannot enforce very strong [indiscernible] (01:10:27) on that device to ensure the date security and application security. So, how do you balance all this thing? I think it's a very complicated problem.

And then on top of that, the reason why you're allowing your employees to use mobile devices for increasing productivity, right. So, what – how do you – whether you actually use – allow users – employees to use company application so that they can actually do work on the road, but a lot of the trend, we actually see so far is at the legacy enterprise applications are PC-based, right? A lot of – when you use this PC-based application on the mobile device, it doesn't work so well.

And actually, it's not touch-based or the screen is small, and searching the menu setups are not quite right and so forth, it's – so, the trend is that they're moving away from this type of legacy application interfaces moving to more mobile native applications and building mobile-specific applications. That's what we've been seeing in the trends. So, really, these are all three challenges that we are facing when we tackle enterprise market and we – Samsung is actually very well-poised to handle of these aspects.

So, in order to handle this, what we actually have done is that we completely reengineered the security property of our operating system. So, when you look at – and we call that the re-engineered version of our operating system – it's an Android operating system, but we call it KNOX, Samsung KNOX, K-N-O-X. It's different from standard Android operating system you get from Google in a way that we actually revised the entire – the software stack coming from the firmware all the way through the operating system and frameworks and softwares to strengthen then harden the device overall. And so to give you a bit of overview on the Samsung KNOX. This is a bit of – it's a bit too overwhelming. And I like to keep it very simple and so – but it's going to be a little bit rocky. So, fasten your seatbelt before you listen to it. Right? You guys ready? Anyway.

So, the key aspect takeaway from Samsung KNOX, this [indiscernible] (01:13:18) platform, the operating system and [indiscernible] (01:13:21) features that – where the security component is embedded into actually start from the hardware itself. So, during the manufacturing time, and we infuse the secret key we call device root key into the chipset itself during the manufacturing time.

And so each device has a secret key which is not revealed to anybody in the world and can only access to buy the hardware separated area called TrustZone. It's inside and it can be executed only by the specialized, the hardware instructions. And they cannot be accessed by regular applications or operating systems. So, with this trust – the TrustZone, only the execution inside the TrustZone can access this device root key and using this we build a lot of capability.

And that's one of the key capability is called Trusted Boot which allow you to measure the integrity of the device during the boot time. Okay? And it can tell whether device is compromised on us from the remote side. Clearly, it's actually – even if the operating system is – couldn't be compromised and TrustZone is the impact and actually really sign the messages that's sent to you. When you receive that message, you can only verify, like, oh, this message has to be signed by that device rookie and that's later signed by that. I'm not going to trust the message.

So, even if operating system tried to do something on top of – it's a compromised operating system can do straight lie about the state of the device and that unless that message is signed by TrustZone, it's not going to be trusted, right? So, when the device is compromised – you can clearly tell when a device is compromised or not. If I don't get a response from the device, it's compromised, okay? It's not able to sign the message.

And then also, if I get the message that message not signed, then I cannot trust the integrity of device anymore. Only time that I can trust the integrity of device is when I received a message, they sign with that, right? That's what the Trusted Boot tells you is to really measure those measurements and the integrity and then really can tell you remote – does remote attached station and capability of device integrity?

And on top of that, we've built what we call a trust on base integrity measurement architecture. It's basically a rear time corner protection. And this is the only, well, what Samsung device, Samsung KNOX device is the only device that actually has a rear time corner protection, okay? All the other – the Android devices do not have this capability. We're the one who actually invented this patent technology. It actually texts all the, like, disruptions, the – where the program code application or the common code is actually executed. The common code is completely protected from any modification.

<Q>: Okay.

<A>: And also it protects certain sensitive part of the common data as well. So, during the run point, if any compromise happen, it actually can prevent it, okay? And also can detect any of the compromise. I can tell to the TrustZone, saying device got compromised. When the compromise actually happens, what it does is actually run a very strong current on the chipset itself, and lower fuse on a device, all right? Which is actually created because when device got compromised, nobody can actually revert it back to saying it is uncompromised, unless you actually place [indiscernible] (01:17:38) people to [indiscernible] (01:17:39) it, right? So, that's the type of security put in there, and that's what we call – there's a lot of other components like framework components that's – that involves a typical management, UPS, and all the [indiscernible] (01:17:53) and all of these things actually [indiscernible] (01:17:55), right? And that we call it KNOX platform or KNOX – even you can call it KNOX operating system itself.

And on top of that, we've build a – so application separation technology called containerization or KNOX container, and that actually give you ability to mark certain data and application that has sensitive data, so that you can protect those applications and data. And then the [indiscernible] (01:18:20) is actually protecting those areas, okay?

All right. So, you can unfasten your seatbelt. So, evolving technology in the life is one thing. We've been actually doing this in more than four years, right? And since I've joined Samsung, about five years ago, I started working on this thing, right? But once we developed it, it was really critical, is that we need getting that accreditations and also the basically approval from the government users or basically the regulator industry owners to saying this device or this technology is good for a defense grade, okay? Meaning, there's a – you can actually even use it for like defense-related data protection. And we got certification from the U.S. Department of Defense [indiscernible] (01:19:28). There's one approval. It's actually a process that actually really review all the aspects of the device and operating system, and to ensure this is a local policy that can be used in defense and in the military.

And also, we got the common criteria certification which is not in the U.S. but it's actually honored by more than 16 different countries. And then also we got certification from the UK and then – or Finland, Australia and China. And if you look at the U.S. side, U.S. bases we actually got even our certification status is actually not only for general throughout usage within the government, also used for very classified network, classified data as one. So, we are the only device to get certified for that purpose. Okay?

And we've been receiving – this year we've got Best Security Software Award from the GSMA, and also recently the [indiscernible] (01:20:41) report actually comparing KNOX against Windows, BlackBerry and iOS and then regular Android. And now it's actually, it scored the highest among all these comparison, right.

And so it's – on top of all this, we – there is the KNOX platform. Now, we need to actually – we are building an application on top of this and – which is what we call, we actually call it KNOX product, KNOX solutions and one thing is the container solution which I just talked about is KNOX Workspace and also we have this enterprise mobility management which is like MDM kind of functionality and we have KNOX Premium and Express.

There's a customization. There's a various type of applications that we build solutions [indiscernible] (01:21:31) and there is in the coming future, we'll be adding other type of solutions which allow any third party application of simply modifying the [indiscernible] (01:21:41) without modifying the source code, we can actually make it KNOX-enabled, meaning KNOX effective application enjoying all the security features that KNOX is providing.

And then there's other components which I'm going to talk about a little bit in the later slide. Okay. First, I'd like to talk a little bit more about the [indiscernible] (01:22:03) solutions that I display there, KNOX Customization. And so when you actually – when we make a smartphone or a tablet, the operating system, all the user experience and UI are really fixed to a general [indiscernible] (01:22:21), okay. But the customers, our enterprise have their own priorities and how do you actually – they want to modify certain functions of the device, also hardware related functions, right.

For instance, you can actually – so on a device there's a home key, and when we press home key, it actually has certain associated functions in there, and then some of the enterprise is our customer requires that home key mapped to different function [indiscernible] (01:22:57) or the customer might say, I want to run it, [indiscernible] (01:23:03) I don't want to allow any other distractions and by users going into different application space and things like that. [indiscernible] (01:23:12).

And so, there's many, many such needs actually arising for every time and such these arise in the past, we have to go back to rebuilding higher binary and then issue a firmware upgrade on that device. And that was very complicated than the process. With the KNOX customization, you can do this even using cloud and really [indiscernible] (01:23:41) basically saying, specifying, okay, I want this function to be mapped, I want this to be functioned this way and then just put your IEMI number which is the identification of the device. And then automatically, when the device is [indiscernible] (01:23:55), it actually configures into what the customer needs.

So, I'm going to show you a video clip that actually describes a lot of these kind of functions, and this is actually lot of our KNOX-related revenues actually coming from this KNOX customization at this point. So, let's go start the video.

[Video Presentation](01:24:20-01:25:31)

So, now, you might wonder how is that really related to security, right, what I talked about. So, what we actually done is that when we built KNOX, we exposed a lot of APIs to manage the device and start building – allowing MDMs integrated with our APIs so that we can control pretty much every aspects of the device.

So – and then, we thought about this, oh, why – if you're going to allow this to MDM, why don't you guys just package this as SDK, allow anybody who can actually implement an application to kind of control the device itself, right, with our security, ensuring that that application is not doing anything fishy because it would actually allow you to control a lot of sensitive part of the device itself. And also, when the – I just talked about the KNOX-enabled application, all those applications that's running on here – actually, it is possible the hackers can get into the system and do something about it.

So, by having this KNOX hardware [indiscernible] (01:26:44) to security, it actually protects from those kind of [indiscernible] (01:26:48) intended use. And so, we have been in a lot of adoptions into specially airlines and like restaurants and very small businesses. And also, recently we're actually seeing this in education when the education publisher they – what they have done is they build an application that gives instructions or so quizzes, right? And then the students actually does the problem solving and they send back their research. And they can actually have interactive sessions remotely with their instructors. Those kind of – this publisher building education tablets instead of a general purpose tablet.

So, keeping the user, in this case, students, really not distracted and just focus on that particular application usage. And just giving that tablet for free to the customer, but they are charging service charge on [indiscernible] (01:27:58), right?

And so, one of the things I like to comment on is at the – we've been actually building a lot of the partner alliance, the number of partners we actually build on our program called Samsung Enterprise Alliance Program, SEAP. We actually got more than about 1,500 application developers building and a customer customize the applications. And that includes MDM providers as well as other, the enterprise solution developers using our APIs to build, really, Samsung-specific experiences, not just an application that runs on any Android but actually utilizing key aspects of Samsung devices like providing pen – writing capability, a lot of security aspect timing with our KNOX security APIs and focus.

One of the things I'd like to bring your attention to is that our recent collaboration with Oracle. We had an announcement on this last month, and what we have done is Oracle actually – they have traditionally been a legacy database business. They've been into – they're actually taking major – lion's share of the enterprise in the market.

And what they're doing is they are now taking that into cloud, right? And the reason for the cloud is that all the mobility aspects. Employees are using their mobile devices anywhere and anytime they need a connectivity, so companies allowing their cloud connectivity and all the application through the cloud. So, all the Oracle legacy function is now moving into cloud, and they need mobile applications, right?

So, they actually have a lot of mobile applications. What we actually done is that we took those – many of those mobile applications and built a native experience. Like, key examples are, like, CRM, ERPs and those kind of applications, okay? And that application is now – we're targeting to build more than – probably this year. And next year, we're seeing about more than 100 different type of application. But that application is – we called that a template, okay? That template is actually really customized into each of the enterprise needs through local [indiscernible] (01:30:49), right? So, our team, not only – so, it actually – the applications we developed that first – it runs really well, performance-wise, on our device, tablets and smartphones.

And number two is that the – it actually uses – it actually uses our security properties, so that application they built is very, very security protected. And then number three is at the – a lot of Samsung specific functionalities actually exposed to them, especially the pen capabilities and a lot – edge screens and so forth, okay?

And so I'm going to give you one example of this collaborations, how – a – the video that I'm going to show you is an application we've done for the AACO. AACO is a – it's a – one of – it's the largest Wagyu beef producer in Australia, and having more than 600,000 cattle, all right? And so, they – it's actually using our Note 4 and then Deluxe S2 to do their typical operations. I'm going to show you the video for that.

[Video Presentation] (01:32:15-01:32:28)

They have requirements for managed water pump. And so, the water pump actually sending the notification when certain water pump is already functioning. And here, it goes out there and [indiscernible] (01:32:36) and directs through of that information weather device at this water pump requires the repairs or [indiscernible] (01:32:44), and that information is really integrated with the backend, the Oracle system of JD Edwards and automatically updating that information. And also here, you can increase the volume.

[Video Presentation] (01:32:57-01:33:10)

So, our new space what the employees have done is that all these smartwatch and they tag [indiscernible] (01:33:21) actually has the RFID in here, and then actually register the household of catalog and using voice activated and all those information is updated into their backend system. So, when the next time when they tag it they can tell all the status the last time and so forth. So, this is actually showing this beautiful integration with the Oracle applications. And we are actually implementing a lot of this applications, also increasing the number of partners doing this type of innovation work, and this is one of our key strategies going forward for the enterprise. Okay.

So, I'm going to finish my talk on that, but with the last slide, it actually shows along with the KNOX platform, a lot of KNOX solutions. What we actually done is that we see that KNOX as a security platform doesn't necessarily live in – only in smartphone, tablet. Only it may not be necessary just for the enterprise data protection. But it actually just being a security platform, it can be applied to the many different type of applications including like health, healthcare data protections, right. It's like we – KNOX is a completely HIPAA compliant, and actually we are building a health software platform.

Another things that we are moving into is like Internet of Things where the new security is really key foundation of – in that industry because you see that connected car for instance you cannot afford somebody hacking into your car, do something, right. So, we are – KNOX is really key components in there along with our Tizen operating system.

So, this is like finances, like a recently Samsung Pay is our finance applications that allow your online and offline payments. It actually build using KNOX as a key foundation component, right. So, this [indiscernible] (01:35:43) security component, KNOX being a key aspects of all our enterprise solutions, and we are emphasizing a lot on the KNOX as really our B2B enterprise brand going forward, right.

So, that's the end of my talk. I like to take questions. I still have 30 minutes. So, we probably

Q&A

<Q - Shawn Kim>: This is Shawn Kim from Morgan Stanley. Just two questions, can you help us, walk us through how you monetize this KNOX solution so maybe as an example with the Oracle? How would you monetize that? And second question is going forward maybe over long-term next five to 10 years. How is that going to change the revenue or profit mix of the mobile business?

<A>: Great. So, the way we monetize KNOX is not – KNOX is sort of – it's built in to the device itself when you open, out of box KNOX is embedded and enabled. And so it allow you to a lot of security on the device. But the way we monetize is actually by building new applications and using KNOX's key components, key example is Samsung Pay.

And also healthcare is another one and IoT, it actually allow you to bill not only just the device-selling business, but will allow us to get into the service business. And so, that's the way we monetize and KNOX being embedded itself, interested in getting that devices of being actually a key point of the revenue making with device how do we represent this as this one is user customer [indiscernible] (01:38:01) they already have that. But when they actually enable certain services and solutions, we're charging customer for that. So one of those is KNOX Workspace charging for that protection of the applications of data, the enterprise [indiscernible] (01:38:17) data, we're actually charging our customer for that. So, going forward that's our key strategy, and building these new services where we're actually giving the customer a value, and that's the point, places where we are – we see that as a revenue-generating opportunity.

In the Oracle cases, there's – we're more of a device play here. So, making our device much more attractive than other devices in a way that it is becoming a price protection for us because these capabilities, if you see that compared to other competitor devices, we're the only device that has that such capability, right? So, when you – things like KNOX customizations and then the other basic securities and things like that, you cannot find in any other places. Once they actually have this, utilize this capability and the next time, they become a duly repeated customer, it really help us through customer retentions and increase the loyalty by having this kind of capability.

<Q - Mark Newman>: Hi. Thanks. It's Mark Newman from Bernstein. Can you talk about how the success of KNOX is doing so far? I mean, everything you present sounds very impressive. But I think there's still seems to be some kind of reputation that people still think that Blackberry and Apple is still more secure. I think there were some fallout from the Sony scandal, it was a year or so ago where people are saying that within Sony, all you have to use only Blackberry, for example. And so, I just want to get some sense, like, what is the success and those kind of statements that we're hearing like even in my firm, for example, I would love to be able to use Samsung phones but we're only supporting Blackberry and Apple at the moment. And so, how do you get over that? I mean, is that just purely reputation issue, and you're going to get over that or – just help us think about that.

<A>: Yeah. It's a good question. The question is that there's a lot of reputational aspects, the Android and it's actually – compared to Blackberry and our friends at Cupertino, and the less secure and that's – a lot of – I see that as a reputational – reputational issues. And recently Blackberry actually introduced the new Android device called Priv, right? And guess what – which device they actually compared it to? They compared it to Samsung KNOX. They're saying, they're not – their security is as good as Samsung KNOX.

We took that as a – really a, okay – compliment, right? So, in terms of – if you look at the, really, technology aspect our device, the KNOX, actually surpasses any other device security protection [indiscernible] (01:41:50). And that's certified by all the government agencies.

So, what we have achieved so far is that the KNOX, being in a production – it's about two years. We have [indiscernible] (01:42:07) the development about two years. And so, this year we have seen more than two times gross in terms of [indiscernible] (01:42:14) KNOX customers. And so, enterprise requires a lot of time. It cannot happen on one day, okay? And a lot of incidence that you have seen – security incidence, none of them actually says KNOX is broken. They're saying, Android has this, and then like recent Stagefright kind of – Stagefright is one of security incidence related to the SMS, but it doesn't really says KNOX's got compromised.

If you put the – your data and application inside KNOX-protected area, so the way we actually enforce securities by providing a separation from your regular, your downloading, like a Facebook application or any applications from the area where you actually mark that as, this is a security area, right, where you put the – your application data.

And so, a lot of the security breach is actually happening on our side. It doesn't really get into our KNOX-protected area. So, given this – still, it's a challenge for us to really improve our reputation. I think that's coming. It's still a long way to go, and because the enterprise needs time, right?

So, recently, there's a very – signature sales that we've actually done to one of the airlines – aircraft manufacturer. And that took us more than two years to do – to make that. Right? And those kind of – so, I see this is taking time. But I'm very confident that it will happen, that we can overcome the reputation on aspect. So, this – by doing a lot more promotions and my coming to this type of event and forum is actually one of the – actually it as effort to promote KNOX as our security on enterprise brands. And I think a lot this – we can overcome this in due time.

<Q - Mark Newman>: Thank you.

<A>: Okay. I think people are ready to go home or shy or...

<Q>: Thank you. My name [ph] Simon O (01:44:45) from Bank of America. I appreciate your today's great presentation. While the sort of little bit data point detect as far as – I think – we are – personally I am very excited with the Samsung Pay. In Korea, local media already highlighted millions, millions of transactions. But the first question is, do you really monitor all the local, global transactions, [indiscernible] (01:45:11), in the U.S., [indiscernible] (01:45:14) in Korea.

Do you have any system looking at the global transactions under the Samsung Pay? And then these Samsung Pay users – they have really – do you believe these can be your intangible asset for your future? Say, kind of the daily, monthly interaction with your – Samsung Pay users because critical users, they usually contact with the local bank cards or credits card companies. But I think that this is a great opportunity to make [indiscernible] (01:45:47) system for your – through your billion, billion potential customers. And so, you are ready to monitor all the global transaction, put a

billion – the [indiscernible] (01:45:58) users? Maybe that's the first question. And then follow-up question. Thank you.

<A>: Great. So, they've been loading a question in a sense that – we are looking at all the user transaction data everywhere. No, no, all right? We sometimes we're being a conduit between the merchant and then the bank, right? And so, we don't actually store transition data unless it is actually – we have a contract form agreement with the bank and then also the users as well, right?

And so, we don't actually monitor all of this, but we know the volume of transactions, let's say, number of transaction that is happening, not necessarily how much in – well, in Korea, we know the volume amount and then other area that different regulatory requirements kind of disallows us to look into some of those data. But the key – I think that your question is about are we – Samsung is ready to utilize these big data, customer data, in a way of the usage, where it's been used which version is actually doing all the transactions, all those things, to build a lucrative service, right, and thus I take that as your question.

And with me – when we approach Samsung Pay, it's not just a wand. It's initially – it is a key retention enhancing capability. So, we like at Samsung pay users the – buy our device because of Samsung Pay. As a result, in Korea, we have seen lot of growth in our sales, device sales, because of Samsung Pay. People are looking for this capability. And we actually – that is already proven in our Korean, using Korean data. And also, we truly believe that since we launched Samsung Pay in the U.S. about a month-and-a-half ago and so we are seeing similar patterns in terms of repeat users, who else user use it. It keep using it and it come back to us because of Samsung Pay. But that's one aspect, right. And what we are looking is like in Samsung Pay is a way to get lot of customers and subscriptions – subscribers and based on that it actually gives us really huge foundation to build other type of business [inaudible] (01:48:36).

There are many businesses you can actually think about allowing users to like – basically they're really handling the finance which is integral component of your personal life. I mean it's – if you look at the SNS, right, it's like a Facebook making a lot of revenues just out of the social network, doing a lot of advertisement, a lot of it, right. Advertisement revenue.

But we don't actually look for this advertisement revenue. But if there is a way given this lot of user basis or by being as part of that key component in the value chain, then this being such a very important aspects of you home and in your personal life, there is a lot of opportunities I think we believe that we can make revenues out of this. And this transform entire, I think the Samsung businesses and we see this as a really key anchor services going forward.

<Q>: Thank you, sir. Follow-up question to the – once the NSP platform becomes more in – massively available in the world, meanwhile the Alibaba Pay or buy to pay become more commoditized. So, maybe – so far sometimes be very successful because of the – it's the only system that can be connected with a magnetic payment system.

So, my question why would differentiation for instance, Alibaba shoppers. They may use Alibaba Pay rather than Samsung Pay. And also once the NFC [indiscernible] (01:50:16), they may use iPhone Apple Pay rather than Samsung Pay, so what would be your strategy for next?

<A>: So, I think the a lot people actually did predict that after two years, the NFC, near field communication, will be prevalent. And so, the advantage we have on MSP will be wiped out. Well, the way I look at this, it might be true that you will have a lot more NFC coming on, and maybe perhaps that's the case that the NFC based this system will have higher level of competition against us. But the way we look at it is that the – that gives us enough of lead time. I'm sure it's more than two years, but within that lead time, we can actually gather a lot of customers and subscribers. And it gives us enough leverage in terms of introducing new services, value-added services.

And so, for instance, like a gift card and a PLCC, private label credit card, there are just – still be magnetic based with other services. And we are thinking of many like other aspects like transportations is another key area, membership, loyalty. And in due time, I can actually tell you more about how we're going to evolve from here, but the services we build once we have the customers, I feel very confident that we can keep satisfying the customers and retain the customers for us, right.

And Samsung Pay may not be necessary just for Samsung devices going forward once we have with customer base, then, it's really – the differentiation is not necessary on the hardware base, but it's a quality of services we provide, and also, the kind of ingenuity we put in the services that we offer. We're having more relationship with the bank, more relationship with the merchants, and that gives us a huge leverage in terms of inventing a new revenue-generating services. That's' – I hope I can actually describe more about that later on, but – okay.

<Q>: Thanks. This is [ph] Steve (01:53:02) from [ph] PanAm(01:53:02) Investments. I'm more interested in the P2P side of Samsung Pay that bypass the traditional network. Could you give us an update in terms of acquiring merchandise and probably getting deals done with the issuing banks?

Then, longer term, what Samsung [indiscernible] (01:53:28) of this P2P [indiscernible] (01:53:30) like versus the traditional, you have the metal side. It's more prevalent in the future or how well Samsung approach this?

<A>: So, on a P2P aspects, many times, I'm stressing that we don't want to read them too well in a sense that the – like ability to move money from one accounts to another. It's already there in the legacy system, right? You can wire transfer and so forth. But it's still complicated. So, what we are we are believing in there is not inventing this system but allowing improved accessibility of these services [indiscernible] (01:54:14) and quickly transfer money between the users and then that capability already actually demonstrated very well in the U.S. that most services, right?

And also, we are looking into that services, implementing that in Korea and other regions as well but taking that and applying it into online and offline payment out of your bank account directly, okay. And so, not only the bank – in the transfer of money, in a really – reducing number of steps [ph] for good (01:54:55) and improving the convenience of users when they do the money transfer but making it so easy to use that money to do the payment as well, right?

So, we're connecting them all the way to the end-point not just transfer but actually applying it to – in Korean one of this we actually done with one bank that we have partner with. Without issuing a check card, right? Just simply registering your bank account you can make offline payment [indiscernible] (01:55:38), right? So, you don't need a [indiscernible] (01:55:41) card basically. Just – when the actual – along with the POS terminal they do the transaction but actually money comes right out or your account.

So, you don't – it eliminates the need for you to go out there to go to ATMs, get the cash and pay. And so, you're really simplifying the entire experience itself, right? So, that's a – we see this as a – more a, really a – as I said, it's – you don't want to invest in new person-to-person, peer-to-peer [indiscernible] (01:56:18) transactions. We would like to invest schemes that allow minimizing or simplifying the step to do their transactions. Does that answer your question?

<Q>: Samsung Pay, I just want to – like, how you see this opportunity going forward versus the traditional – the other network payment?

<A>: So, I mean, going forward, it's – P to P is going to be – I think it's integral components, our Samsung Pay services. And we – because this actually really make – I mean, a lot of users that has bank accounts would not [indiscernible] (01:57:07) that they have check card or the – and also the credit card. So, it gives a – giving the banks opportunity to reduce their cost because they don't have issue plastic cards anymore. And also – so that's – connected it to the really a shopping experience is going to be our key components going forward. Yes. All right. Thank you very much. Are we done?

<Q>: One last question.

<A>: Are you saying no to my answer, no to no more question? Go ahead.

<Q - Claire Kim>: Thank you for taking my question. My name is Claire Kim from Taishin Securities, Seoul, Korea.

<A>: Yeah. Nice to meet you.

<Q - Claire Kim>: Nice to meet you again.

<A>: What's your phone number? No. I'm just kidding.

<Q - Claire Kim>: Sorry to make – ask a question about Samsung Pay again. When you negotiate with overseas contractors, I mean overseas credit card companies or banks, what is the major challenge compared to when you do negotiations with domestic Korean financial institutes?

<A>: So, the question is that when you do the transaction, there's domestic transaction versus overseas transaction. When you make that transaction being sort of ubiquitous, it's kind of not limited by geographical regions, and how do you actually – what are the challenges behind that? The key challenges, there are many systems that are actually more of localized systems. And so, when we build our – the payment services, customize that to that local system, and often – it is often the case it doesn't work oversea because the oversea actually has completely different, more standard approaches.

So, that's the key challenges. We – that's one of the things we have see in Korea is that we actually developed our payments services based on their proprietary mobile payment services called [ph] FR (01:59:31), an application card, an app card. And once – when we built that and launched that service in August, we couldn't make it work in oversea because oversea uses more standardized Visa, MasterCard and American Express type of TSP services. So, that's the key challenges.

What we actually have been doing is that we are influencing local market so that they adopt more like international standard. But there are a lot still there many markets that actually adopting their local proprietary services because they don't want to be, in many cases they want to reduce their transaction charge and fees. So, they create their own network, right, and their own key mobile payments scheme, I think, right there. But I think we see more trend to adapt this international formats and scheme. So, that's kind of the challenges will we use going forward. But I think it's going to still be a big challenge.

All right. Thank you very much.

Unverified Participant

Thank you. We'll have a 10 minute break. So, coffee then [indiscernible] (02:00:56) outside ready. Help yourself and see you all in 10 minutes.

[Break] (02:01:01- 02:01:06)

Unverified Participant

Please be seated. We'll have the last presentation for today. The presenter, [ph] Mr. Mark Bernstein (02:01:15) from Samsung Research America. Please give him a big hand.

Unverified Participant

Thank you, everyone. Just as a little bit of context. I first joined Samsung on November 15. So, if I were in Silicon Valley where I live today, I'd be celebrating my third anniversary. But rather than do that, I'm here with you starting my fourth year of service, which is a very Samsung thing to do. So what I'm going to talk to you about today really is very much the reason I came to Samsung three years ago. One of the – one of the areas that I think is very important to try and communicate to you or some of the things that we're doing in Silicon Valley to really help facilitate Samsung's future. So that's what you'll hear today.

How many people think this is a good idea? [indiscernible] (02:02:31) innovation. Not everybody's hand went up, right? So it is kind of a question but the fact that you are all very aware of is that technology demands continuous innovation. If it's not there, things will break while people will simply lose adoption, a lot of diminishing returns will take over. So this is a very – it's a very important question to think about. And it's one that really is a guidance principle for us at SRA and Silicon Valley. It guides how we think, it guides how we're organized and it guides how we operate

as an organization.

Being in Silicon Valley, there's something very unique about the innovation ecosystem there that you're all I'm sure very familiar with. That's one of the reasons why Samsung has invested in Silicon Valley. And so our role as an organization is to really look at what goes on in Silicon Valley through the lenses of Samsung, both in terms of the strengths that we have at SRA and Silicon Valley, as well as what we see as the need of Samsung for the future.

So this is – this is a snapshot that I'm sure many of you in this room are very familiar with. It's over the last few years, there's been this resurgence in investment, investment in innovation. It's not quite at the levels that we experienced back in the Internet here, at the advent of the Internet era, but the number of deals are actually greater than they were back then.

And predominantly, what you will notice here is that we've got a dominance of technology investments in all of those startups. And the second thing is that software is the dominant technology investment. And it's increasing.

And I think there's a couple reasons for that. I think that if you look at progressively the value that users experienced from technology, actually comes from software. If you look at automobiles, the dominant value compounded in automobiles is in fact software. It determines the character of how the car operates and determines the kinds of information and entertainment that we experienced in automobile.

There was an expression that Marc Andreessen, a famous Silicon Valley BC investor acclaimed last year is that software is slowly eating the world. And I think what you're seeing is this progression of software starting to migrate into all aspects of technology. You'll also see this fact reflected in the focus areas that we work on in SRA.

This next slide here, I'm not using the term unicorns here since they're obviously no longer so mythical or so rare. But what you'll see here is two things, it's that this is a global event, it's not a Silicon Valley event. There's significant number of start-ups with very high valuations. Part of that is because much more of venture capital investment is going towards late-round investment as opposed to seed investment. And then, you have this whole question about what are valuations if there's not a liquidity event. But my point here is that there's obviously a very significant value that's being placed on some of these opportunities. And how much impact they'll have on the future of technology.

And so, what sort of fuels this, in addition, if you think about the software metaphor that I just went through from my own personal experience being at Xerox [indiscernible] (02:06:33). I saw the advent of what was called ubiquitous computing back in the late 1980s and early 1990s. Mark Weiser first coined the phrase. And there were two parts to the concept. The first part was that computation which, at that time was confined to desktop machines and CRTs and very heavy disk drives, that all that computation ability was going to disintegrate. It was going to migrate into the environment. And I think that's what we've seen over the last 20 or 30 years. Certainly, from being at a work station clicking and looking like this to bumping in the people down the street who are no long clicking, got their heads down touching and swiping. So, there's this advent of computation and human interaction with computation that has transformed the way we live, the way we work in very – many aspects of our life.

But the second part of the division, the second part of the ubiquitous computing was that all this computation once it migrated into the environment would be actively helping us do things, actively helping us lead our lives, identify tasks and complete them for you without being asked. And we're not there. But this is that – we're at that point now. You're starting to see that. We've been through this past 30 years where the amount of human attention required to our devices just to make them useful for us was incredible, but we're starting to see that turn and really reflects this advance in artificial intelligence that has been going on in Silicon Valley primarily.

Obviously, all these devices that we produce that are in our environment are producing incredible amounts of data, incredible amounts of unstructured data growing at 40% to 50% a year. Most of the unstructured data that we have all stored is never going to be looked at. We don't have the capacity to be able to identify what is the importance of that data. It's completely unstructured. It's got to be analyzed. So, until we can create autonomous analyses and the ability to be able to render intelligence autonomously, we're still going to be suffering with this continuing advance of devices and continuing accumulation of data.

So, Samsung R&D, I don't think it's a surprise to anyone that Samsung is one the world's leaders in investing in R&D. Over a quarter of its workforce is in some form of research, development, or engineering. As you can see, $38 million invested daily in all of these sites around the world, all of them working on various aspects of R&D.

Which brings us to SRA, our SRA is not a very old organization. It's less than three years old. We've just moved into a new campus earlier this year. Those of you who are familiar with Silicon Valley will see to the upper left hand corner of your screen is [ph] 101 (02:09:53). The campus is right across from Moffett Field. It's right across Google, Microsoft, Motorola and a number of other companies that are very close by. So, Samsung is clearly making a statement with this campus.

We have over 900 people there on the campus. And I think one of the – two of the most important aspects for you to understand about SRA, number one is the breadth of what we do in our R&D agenda. We are working on products. We are working on product innovation. We are working on services. And we are working on service platform. We're working around various aspects of advance software. And we have the only user experience complement outside of Korea for Samsung. And I'll talk more about all of these.

I know you probably can't help but notice there's a – we're right next to a golf course. Unfortunately, I have yet to step on to that course. We're very busy at work and not many people have much time to get out there but maybe one of these days.

The first topic I want to talk about is product, product innovation. We have one group at SRA called the Think Tank Team, TTT, as they're affectionately referred to. The latest Gear S2 is really the culmination of the vision they had for smartwatches two years ago when the first Galaxy S1 was delivered.

And with the S2, the two critical components for that initial vision have been realized. Number one is the circular display. There's no fusion of the display. It's a circular display all to the way to edge. There's no masking where connections are made to the display. That is a significant innovation.

The second is the rotating bezel. If you think about these small variable devices do not have much screen real state, so the ability to be able to select what attribute, activity or application that you want to run is a very important part of the user interaction. And what you see here is a very simple and intuitive way for that to take place, much more compelling than turning that stem of a watch that you may see in other competitive devices.

What I'm going to show now is a brief video that sort of demonstrates those two aspects.

[Video Presentation] (02:12:27-02:12:57)

This just been launched in Berlin a few months ago. The response have been incredible. I think there's more people get the chance to use them. The word is going to be around that this is really an incredibly functional device. It's not only come to the number of the different versions, it also is a stand-alone device with a 3G communication capability and voice interaction. So, it's a very interesting advance in wearables.

Another project from the Think Tank Team is called Project Beyond and this is a very – it's a fascinating story from my perspective. The team has created not just a new product, but something that really enables a whole new class of user-generated content. The way they worked through this in the course of nine months from initial prototype of products, they iterated through six prototypes in those nine months. And somewhere probably in the middle, this video was produced.

[Video Presentation] (02:14:06-02:15:20)

[indiscernible] (02:15:14) automated video stitching. You can see all the components here. It's been a beautiful finished product here, beautiful, beautiful device. And there will be other devices that will folow. This is just simply the first in a class of what was produced as the ability to be able to virtually go and experience. What we have right now – we have two of these deployed in an archeological site in Turkey. And you can go up to the Think Tank Team lab try on the Gear VR headset and simply look around, you can see the other people at the archeological site, it's incredible – an incredible experience. And something – some of you may have noticed last weekend, the New York Times launched a

VR app around stories that they are producing. In the first story, they chose – was three children – three refugees. The current refugee crisis from North Africa and the Middle East into Europe is extraordinary. And – so, the story was basically, told through the eyes of these children. It was very compelling. New class of experience.

So, I want to talk a little bit about platforms. You just heard from – in [indiscernible] 02:16:41 about the KNOX platform. We also have the Samsung Pay platform in his organization. One of his team is in – is part of the SRA organization and we work very closely with them. We collaborate with them not just to help them deliver what their platforms are about, but also working on them to figure out how to really extend the platforms.

So, some of the questions from you about Samsung Pay and about KNOX are spot on. We're starting to look at being able to take go from a B2B and enterprise KNOX platform to looking at a My KNOX, a KNOX for healthcare, and a whole hosts of very targeted applications. Same thing true for Samsung Pay. Being able to extend the functionality and value of the services that you can offer on the platform that really add value to the underlying hardware platform that Samsung produces.

Intelligence. This is my favorite. Again, going back to what we talked about in disruptive forces and thinking about where the world is headed. You think about the artificial intelligence that has been flowing through Silicon Valley in the current application of it to understand the environment around you and be able to operate base on what you see and what you know. Autonomous vehicles, drive those cars, robots, all that is very important, but it's all driven by being able to understand the world around you. What you see here is really the context – eight contexts for how Samsung thinks about intelligence.

This is a vision of the IOT future that we have, where of each of the devices is connected either to each other or through a HUB device, the rest of the devices. Each of those has an independent functionality. Each of them is producing data. And so, if you look at our research agenda, we're focusing three key areas, thinking about data analytics, so one

We use machine learning technologies in order to understand what the data is telling us with both in terms of big data but also thinking about the contextual data that is individualized through interactions with users. And so if you look at the machine learning technologies we're using, it is leading edge. We're working with the latest GPU clusters, being able to do very high performance image and object recognition. And this is where we distinguish ourselves alongside the folks from Microsoft and Google and Facebook. We look to be competitive with them. They are more cloud-based, cloud-oriented service companies. But where we are focused is being able to define these rich models and then be able to take those models and put them on a device and really enhance the value and performance and function of that underlying device.

The second part of our agenda is around the distributive systems which is basically what Internet of Things represent. If you look at where we are right now, there's roughly 13 to 15 billion connected devices in the world. That's going to grow over the next four years to over 50 billion devices. And as you think about that, you think about all the data that those devices are producing, something has to give. And I'll talk a little more about the communication technology required to enable that, but we have to start being able to do a different way of architecting and thinking about the distributive systems that are in the home as basically [indiscernible] (02:20:38) from smart homes to smart cities and to global real-time services.

All of this is going to require cooperation and accommodation at the framework level that you see here in the home. Our devices are able to understand when there's a failure, to be able to understand the resources that they're sharing with the other devices in the house, to be able to adapt to new devices coming on, to be able to adapt to the new software that helps them interact. So, all of this has to be comprehended in the form of software, and that's what we're working on at SRA.

All of this is intended to support the delivery of really compelling services here in the context of the smart home. But in any scenario where you think about smart, there are issues around data and that has to do with security which everyone is, I'm sure, very aware of. But also in the case of the home and in the case of personal devices, it's your personal private data. And one of the areas that we're very focused on is really thinking not just as an add-on but from the

ground up. It's an initial part of the architectural assumption, giving users the ability to control the use of their private data, what do they want it made available for and what do they not.

And if you think about being able to get services through any application on a mobile device, and you look through the list of permissions that you have to grant in order to use that application to a very frightening prospect. So what we're thinking about is a next step whereon Samsung devices you as an individual be able to control each and every one of those flaws of personal data.

So another part of this vision has to do with 5G. Samsung is a leader in 5G and has been for the last five years. We've deployed tests in Korea, in advance of the 2018 Winter Olympics where there will be a full blown deployment of 5G, but also in the United States through our Dallas web. They've worked very tirelessly over the last few years focused on the base technology, the core technology that service providers will have to deploy in order to enable 5G overlays onto 4G data – or 4G data networks, looking at LTE.

So it's not as if 5G is going to replace 4G, it's going to have to work on top of it. It's simply going to be there in order to enable 10 times better data flows in terms of bandwidth and data capacity. It's also there in terms of being able to reduce latency that exists for data flows. So all of those are fundamental essentials if you think about these seamless services, if you're thinking about streaming ultra high-def video. If you're thinking about virtual reality experiences or very rich user experiences on mobile devices, all that is going to have to happen through the air waves. And that's where 5G is going to come in.

If you look at where Samsung is at, it currently holds the world's record for the highest data rate of 5G. It's 7.5 gigabits per second. That's a pretty incredible, incredible number.

To user experience, this is another very important part of what SRA does for Samsung. Again, looking at what you find in the Silicon Valley ecosystem, our user experience is a very high form of art. If you look around, the Stanford d.school was started by David Kelley who led the thinking around design – it was called design thinking in his company, IDEO. And so, many of the people that we have on our UX teams in SRA are students of David's. And they understand the notion of being able to do visual design, a user interaction design and motion design for users interacting with information.

The other aspect, I think, that's important is that, as I mentioned, the only UX team outside of Korea is at SRA. But SRA is actually meeting the UX for all of the flagship platforms in 2015. And I'll talk a little bit more about that later. But as you look at 2016 devices and beyond, you;ll start to see more and more of the influence of SRA's user experience thinking come into play.

In particular, I think these user experiences are important as you think back about the last slide around intelligence, around the smart home. This whole connected life experiences need to be more effortless. They need to be driven by predictive services, by services that anticipate what our needs are and act on our behalf and a lot of that has to be driven by really effective design from a user perspective.

One example of that is what you see here. This service which was launched in the U.S. earlier this year is called [ph] Extra (02:26:08). You'll notice in the upper right hand corner TV screen is the little tagline of [ph] Extra (02:26:17). There's actually a button on the U.S. market remote controls that says [ph] Extra (02:26:23). And by stroking that key, what you initiate is a sidebar of contextually relevant information. What you see here is a Twitter feed for people who are watching – what is this – this is – yeah, Big Bang Theory. Yeah. Okay. So if this is just one instance of services and you just start to think about what's possible being able to reach out to third party partners and being able to integrate content that has relevant that's a tremendous aspect enhancing the user experience.

I know right now, we're preparing to deploy this in other parts of the world and also incorporating just common day useful things like weather and news. The other aspect of [ph] Extra (02:27:20) is really thinking about real time, real time analytics. This is my favorite team, the Golden State Warriors who won the world championship for the NBA last year.

[ph] Boy (02:27:34), yeah, for any sporting event now in the United States is the ability to be able to pick on the extra button and to be able to get not only stats and information but to be able to go in and interact with information to create your own custom information template about your favorite players or what happened in the third quarter versus what happened in the second quarter. So, again, another example of interactive services that are there to enhance the value of the hardware platform.

So, I've talked about each of the areas in the SRA agenda. I've talked about the fantastic interdisciplinary teams that we have in both software, hardware and design. I've talked about our focus on interacting with universities start-ups and other partners in Silicon Valley, all with the intention of being able to accelerate innovation around the areas of our focus and being able to deliver value back to Samsung. We think what we do is unique because of where we're located. We think it's valuable because of the work we do with that content.

So, that's all I have to say. I'd like to thank you. I'd also like to thank my strategy team, [ph] Sonam and Jacob Kim and Alex Gau (02:28:56) who put this content together under very challenging circumstances but I won't go into. But they're very much a part of why I'm excited about being at SRA and sustaining our commitment to doing great things for Samsung in the future. So, thank you.

Unverified Participant

And I believe this is portion where you get to ask questions. So, please.

<Q>: Hi. Just a quick question on your investment decision. So, when you – how do you allocate your R&D funds? So, what is the process of deciding whether this is a good project or not? How do you measure that? And is there something like – employees, are they incentivized to come up with a new innovation? So, just the whole process...

<A>: Yeah. I think that's a great question. I think that's one of the things that I tried to bring to the SRA organization from my experience in Silicon Valley, is really not just bringing an understanding of what goes on, but actually, trying to change the practice of how Samsung does R&D.

So, to your point, yes. There are incentives for employees that are very similar of what we find around Silicon Valley for new ideas. We have IBM made innovation jams sort of famous where you have teams that come together. We just had one a few months ago where we had about 120 employees come, form teams, generate ideas, and then have a sort of a contest to see who have the best ideas and the best ideas we've chosen.

To go back to the more important question, is how do we allocate resources, it's always a challenge. The fact, is that there are more than enough, very innovative ideas to fund, and there is money to fund them. That's a fact of life in Silicon Valley.

So, it's a very rigorous process. We look for obviously, alignment not just with the things that we can do in Silicon Valley, but how important is that to the headquarters in Korea. Do we have alignment? [indiscernible] (02:31:36) the dependencies that exist in getting this idea into an innovation and getting in to a technology that can go under a product or a service is an alignment in being able to do that. Those are all questions that we ask ourselves and we ask together with headquarters. So, it's a very interactive process. It's not something that we look to headquarters for direction and specification. That's the way it was done 5 years ago, 10 years ago in the preceding SRA organization. It's intended to be much more collaborative, much more open and much more value-focused. It's not simply about what a researcher wants to do, it's about having a compelling story as to why it's important for it to be done.

It's a solution that is really well-suited to what we can do and is it well-suited to the platforms that Samsung has so that – with the value that we create out of the work. So did that answer your question?

<Q>: [ph] Hi, Park (02:32:39).

<A>: Hi.

<Q>: Hi, [ph] Park (02:32:45). I would like to understand about how standard have especially the 5G standard. What are the process? And how does the industry come on with the standard? And where are we now at setting the standard, 4G to 5G? Thank you.

<A>: That's a good question. So, the standards process is they are some that are international and some in telecommunications that are obviously regional because of the infrastructure, infrastructure that's involved. The team in Korea has been working with the Korean Standards body. The team in Dallas has been working with the U.S. Standards bodies. We are – we have membership on many of the working groups that are building those standards. We have lots of prototypes that we've demonstrated in support of what we proposed is standards. Do they have then all in place, no they do not. And like many standards, many of them will not be in place probably until after the technology is deployed and in use.

But I'd say, from my perspective, on the provisioning side, there's two parts. It's really the – there's the client side of the 5G technology and the modems required and there's the transmission side on the telecom service provider side, as we move further along in the telecom side that we are on the device side.

But I think only by producing these working prototypes as the plan is for the Winter Olympics in 2018 that you can actually demonstrate, okay, it's not just that we can do faster, faster for what to start to showcase some of the services that actually get supported or impossible to achieve with today's technology. So, it's a bit of race condition around being able to showcase technology before it's approved.

<Q>: Thank you.

<Q>: I just want to get a better understanding in the – do you collaborate much with other Think Tanks in the Silicon Valley, or is it really a very independent, isolated thinking when it comes to do with research?

<A>: No. It's not. It's another aspect I think that's very [indiscernible] (02:35:06) very different. I think it's very different over the last 5 to 10 years, but there are technical communities. There are conferences where everyone participates. We participate with Apple, Google, and participates with Facebook. So, there's the context of technology perspective and technology practice that individuals in their network often share. And then there's the actual application of it in the business context, and those are sort of kept separate. So, to answer your question about collaborations, we have lots of collaborations in consortia.

So, you see Berkeley has a number of technology consortia where there are a whole host of industrial participants. As industrial participants sort of select themselves, it's not a matter of Berkeley choosing who they want, it's a self-selection process. So, that's a more democratic approach to collaboration. But there's also point-to-point collaboration. We've had a number of projects that we've done with Park – with my old company, SIR, worked with other industrial labs, Microsoft, Baidu. But these are very much not yet at the point where there's actually business consequence to the collaboration. But that's clearly – it's in the understanding. That's in the context of why we would want to work together.

There's obviously some technological complementarity that we create by working together. But the outcome of that is something that neither of us can do, and it has to be of value to both business context. So, it's very different than it was 10 years ago; very different. Much more competitive particularly for talent.

<Q>: You've mentioned about the increased influence of SRA in 2015 for last year products. What specific change has been made in the product because of SRA's existence? And you've mentioned increasing influence in 2016 and onwards and you wouldn't be able to give the specific product features but what would be the keywords of change in your product?

<A>: [indiscernible] (02:37:56) I think it's a very reasonable question to ask. So, if you look at the 2015 – just let me step back for a second. So, SRAs role is to actually lead in what gets deployed and define what gets deployed in the U.S. market. So, if you look at the 2015 U.S. TVs, the entire home screen, [indiscernible] (02:38:19) experience, all of that is defined by the [indiscernible] (02:38:24) team in SRA. Then, we also work in collaboration with the [indiscernible] (02:38:29) in Korea to think about, okay, how do we take some of the concepts that we've implemented

in the U.S. market which tends to be the leading market and how we'll start to think about which of those features in the user experience will be valuable to globalized and then how do we do that. So, we have an influence from the global platforms, but we have, I think a more directive influence on the U.S. platforms. Same thing is true for mobile devices, for the Galaxy S and for the Note series. As you look at the nature of what it is like to interact with applications in native services on the devices, you'll notice a market difference in 2016 from 2015. And it's all driven, I think, primarily by a belief in what I refer to earlier as a sort of design thinking, understanding user needs, doing user research, doing the modeling, doing testing, and then understanding what works best for the users and how those context varied from one class of user to another class of user, and being able to optimize what actually gets deployed.

So I can't tell you specifically, I can't for the 2015 TV because it's already out. But for 2015 GS devices, I think it's more of a look and feel of the widgets. But I think you'll see a more dramatic influence in the 2016 products.

And those will be arch for the Galaxy device and [indiscernible] (40:17) device in the mobile space. In CES you'll see influence from SRA on the next generation of TVs, and also some of the mobile tablet devices.

<Q>: Hi. Thanks. Since [indiscernible] (40:37) you wanted zero [indiscernible] (02:40:38) for clearly a very different company, I wonder if you could talk a little about the culture of Samsung since you've been in Samsung now, three years you said.

<A>: Three years.

<Q>: And...

<A>: Three years and one day.

<Q>: Three years, one day.

<A>: Yeah.

<Q>: I guess, specifically on the innovation side, how creative really do you think Samsung is and can be, and do you think that all these things that Samsung is doing now with SRA and your open innovation center, many things going on. Obviously, Samsung is making a big effort to being more creative, be more forward-thinking rather than the fast follower. And do you think that it's taking the right steps culturally? Do you think it can really be a creative leader in some of these new areas?

<A>: Well, that's why I went there. I've known Samsung for a long time. So, when PARC spun off from Xerox in 2002, January 1 of 2002, the first day we were open for business, Samsung was at our door. So I personally have known Samsung for all that time. We did a number of projects with them in various domains, display technology, wireless security, networking, user studies, user modeling. There was never any question about the intelligence of the people we were working with. But I think you're right. if you think about the culture of Samsung, it's very much a more directive culture. And I think PARC was much more orthogonal to that. Part of the reason that Samsung wanted to work with us was not so much whereas to do things for them that they would adopt, but that we – our model was that we did things with them so they would learn basically how we think about innovation. And they can incorporate some of those processes as they choose and what they take away from a strategic partnership that we had with them.

So, when I left PARC again, Samsung was the first to reach out and ask me if I were to interested in helping them rethink how they did research in Silicon Valley along the lines of what we did at PARC. And I told them quite frankly that I don't think – didn't think they were ready to do that, but they kept at it and they tried to prove to me through working in a couple of projects that they really were serious about being able to transform how they do research. I came on with the belief that they were genuine about that commitment and we made a tremendous amount of progress in the last three years. I wouldn't be there if we have we gone as fast and as far as I would have hoped. Not quite, but I think the commitment is genuinely there to really transform how research is done.

The problem that you have, Samsung is all about execution and creating the credibility based on the results you can deliver is what we'll feed on itself in order to create adoption, if this actually does work. And so we're on that path. We're doing – we've made a tremendous amount of [ph] headway (02:44:13) in being able to showcase in the style that

we work. We're able to produce things that are very valuable and adopted by them. So, it's a work in progress. I think it's all innovation [ph] where our organizations (02:44:25) are, but I've been very, very happy with the commitment from all the Samsung executives including all three CEOs who came and visited us in September when we talked with them about what we saw in Silicon Valley and what we saw that the future needs for Samsung and there was a tremendous amount of resonance about that and a lot of encouragement for us to do that. So, that's about the highest performance support I think we expect inside of that organization.

<Q>: Thank you, Mark. Great presentation and [indiscernible] (02:45:04) so far. My name is [ph] Simon (02:45:06) from Bank of America. While the innovation [indiscernible] (02:45:10) evolution especially to the Silicon Valley's [indiscernible] (02:45:14) of the world and all it face smartphone in any way [indiscernible] (02:45:17). Also the IoT is also coming from the Silicon Valley. But looking at the real [indiscernible] (02:45:24), the wearable device what do you think? Now, you're already successful so far for me.

<A>: Yeah.

<Q>: And for watch, nothing.

<A>: Yeah. Yeah.

<Q>: But why would be the Samsung's innovation there because IoT wearables, no monitoring [indiscernible] (02:45:39) much. And then – but you are talking about Galaxy S2 and also all the well-known phone devices and TV but those areas are already saturated. So, why would the real innovation coming from the Silicon Valley these days? Thank you.

<A>: Yeah. It's right. I think I tried to give you a couple of examples about the other platforms that we're working on and thinking about the services that extend the value of what's underneath. To your question about wearables, as you saw, I think, in the first presentation today, the application, the uptake for wearables is primarily in wellness or fitness or health. And I think as you look at the S2, the quality of sensors that are being used in the devices has greatly improved.

By and large, the sensors that are in wearables are not very good. And so what that means is the quality of the data that you get, the value that comes back from the use of them pretty much dissipates over the course of three months and they get turned in the drawer. So, I think the test of the value of wearables is still being measured. I think that the S2 is a tremendous improvement over the S1.

I think – you saw an example from [indiscernible] (02:46:58) about applications for wearables and an IoT context. If you think about what can be done with the wearable when you need two hands to do what you're doing, there's a use case that can be made there.

I think there will be other forms of wearables that are more specific. I think as you look at IoT adoption, clearly on the industrial side, they're for very specific uses. You also heard [ph] John (02:47:28) talk about the customization of the hardware platforms, of the tablets for different customers or for different applications, whether it's on education or healthcare or finance or whatever. I think that you'll see software enabling a lot of the customization in wearables that together with better quality sensors and more intelligence surrounding the user, and of the wearable and the environment, but there will be other use cases and other user scenarios that start to emerge from that. But we're still I think at a very early stage for both wearables and for IoT.

But to your point, I think that's what everyone who has looked at the market realizes is that the transient from purchase to disuse is not very long, and it's simply users get bored or they just don't get find much value in the new setup.

<Q>: Thank you.

<Q>: Thank you for taking my question. My name is [ph] Clare Kim (02:48:48) from Taishin Securities South Korea. As far as I know, a team from Samsung Research America is working on next-generation display and material, and even though maybe there would be some part of in the future, but since it's not officially launched yet, can you give us any color on how to [indiscernible] (02:49:19) SAMSUNG DISPLAY and what are the challenges and opportunities

for next-generation display product?

<A>: Yeah. So, Samsung has a number of display organizations in Silicon Valley. Some of them are working on new materials both for liquid-crystal displays as well as for organic LED displays. I think the team that you are referring to, which you probably should know about is actually thinking about a different modality for display. It's a different state, a low-power state if you will when the TV is not on.

And so I think that if you – anyone who has a large screen TV it's hard to not notice that big black rectangle which just kind of sits there. There's value to having that surface area being more useful and more valuable to the user. And that's the context for how the team is thinking about. This is surface area that can be useful for intelligent display of information that's contextually relevant to a user without them having to turn on the TV and select the channel or choose an information service. And that's again, it's in this notion of smart home and intelligence.

Obviously, there are a lot of applications for display technology outside of the home. Digital health is one area that we are very actively working with partners on, but I think beyond that, I probably shouldn't say – shouldn't say much more.

<Q>: My question is – how much does Samsung group have a say in your research agenda? And number two, is how do you think about KPIs or return on investment or return on resource.

<A>: Yeah. I guess I didn't quite get to that – to that part on how do you assess projects in KPIs. Because as you get – KPIs are not for everything. I think that KPIs are very good where performance is measurable and where – in nature of that measurement actually indicates a degree of quality of performance of the technology in a finished product.

So, I think it's much easier to assess the value of a project outcome in a product than it is in a prototype or than it is in a concept and a path. To a point about how we – how does that reflect back on our agenda for what we do. So, I mentioned the platforms and I mentioned the teams that supports [indiscernible] (02:52:29). So, if you look at platforms around your VR and Samsung Pay, and KNOX, and Extra. The quality of services obviously, there is a roadmap that's established when your services are launched and those roadmaps are being constantly defined with the product team.

So, there's some things that the business group is going to ask for. And then, there's always the question about which is higher priority and do we put more resources on this versus that, but that's a continual conversation. In terms of research, I think from my perspective, if they already to be able to identify what the most important questions are, and the logical path to how to get to a very robust answer to those questions in the least amount of time and the grace amount of certainty is a successful research outcome. And so, I've been fortunate that I've been able to attract people in Silicon Valley. We're working in advanced software research, and we share that view. Early on in research, simply having papers that are peer-reviewed that are in the highest peer journals that reflect a respect for the technical community, for the quality work being done that sometimes efficient. But also we want to look at if there's an application for this concept, do we have the strategic intellectual property captured in order to protect that as a [indiscernible] (02:54:14) when we start to develop it more.

So, it's a spectrum, is my answer about how you measure it. It's not a one-size-fits-all approach, and I think that's an open discussion with Samsung. Samsung from Italy [indiscernible] (02:54:34) started as a manufacturing company, and I think that a manufacturing perspective provides a different contextual view for research and outcomes than you get from a software company. So, you think about rapid, innovative prototyping to sort of test and understand failure and improve on that in a innovative fashion is something that a manufacturing people are very excited by it because manufacturing is a very expensive process. And a lot of investment goes into testing hypothesis and that's not – simply not the case with software which is what makes it very attractive for software companies to form. Did I answer your question, more or less?

<Q>: Yeah. Okay.

<Q>: The last chance.

<A>: Okay.

<Q>: My question is your new business opportunities particularly the M&A activities. [indiscernible] (02:55:43) the bio and the [indiscernible] (02:55:44) area just my personal...

<A>: Which area? Bio?

<Q>: Electric vehicle [indiscernible] (02:55:50).

<A>: Yeah. Yeah.

<Q>: [indiscernible] (02:55:53) management, all the IoT inside of the car. I think these areas are really important. So, do you have any team for the bio-related research or M&A? Also, any plan to do more, kind of electric vehicle development or related components software development? Thank you.

<A>: I think he knows the answer. He has experience in the automotive industry. One of the unique things about Silicon Valley is that there are, I think, 17 automotive R&D labs in Silicon Valley. We've talked with all of them. I think there is a mutual interests around technology for connected car, whether it's autonomous vehicle or simply the next-generation of traditional vehicles. So, there is a lot of discussion that we're having and it comes mostly from this sort of seamless experience, this connected life as I go from my connected home to my connected car to my connected office. How does that transition occur, how do I remain productive and aware of what's going on in that, that sort of a context for thinking with the automotive labs.

And they see Samsung differently than they do Google or Apple or even Facebook where they see them as potential competitors. Apple finally gave it up but they've got about a 1,000 people not so secretly working down the street from where we are on an Apple car and Google has been very visible about all of their efforts around autonomous vehicles.

So I think there is opportunity for Samsung in that space significantly. And we're actively working with automotive manufacturers on projects.

In terms of bio, we do not have any competencies in SRA that are focused on bioresearch or development. We do have areas around healthcare that we're very focused on, but really more so, around the technology platforms that Samsung already has.

Samsung, again, is seen as a very attractive partner because it has so many touch points with individuals and ultimately, healthcare is about human behavior and optimizing human behavior that results in better health. So, Samsung is seen as attractive from that standpoint. But in terms of bio specifically, there's nothing that we're doing.

Okay. Thank you very much, everyone.

Unverified Participant

Hey. This is all we prepared – we have prepared today. Did you enjoy our sessions? It looks bad. Okay. Before – I hope today was very [ph] good (02:59:22) chance to understand what's going on at Samsung for the future.

So, before wrapping up today's event, I want to remind you about our shareholder return policy, we announced a couple of weeks ago. If you're interested here. Actually, for a long time, in terms of capital management, Samsung has focused on investment in capital expenditure, R&D and marketing activities. Through those investments, we have been able to achieve sustainable growth and have a positive free cash flow to add to our cash balance.

In the last couple of years, we have been looking for ways to use the cash to create long-term value for the company as well for our shareholders. Actually, we have [indiscernible] (03:00:22) about capital management and shareholder return from investment to community. Based on our comprehensive review of our business and shareholders needs, we announced our initiatives on shareholder return.

First of all, we decided share buyback and the cancellation of $10 billion. The company believes that our current share price and the market value of Samsung Electronics are severely on the barriers [indiscernible] (03:01:00) we stand, we will cancel all the [indiscernible] (03:01:02) that we purchased, and we expect to buy and cancel about 5% of

outstanding shares by next [ph] two years (03:01:11).

The second part of [indiscernible] (03:01:15) initiative is the three-year shareholder return policy from 2015 to 2017. The company will return 30% to 50% of annual frequency flow to shareholders for the next three years. The annual shareholder return will consist of dividend and share buyback, and we will focus primarily on dividend, with the remaining allocated capital to be utilized for share buyback. Any shares that are purchased will also be canceled.

Lastly, we are currently reviewing the introduction and implementation of our quarterly dividend policy in 2016. In conclusion, I hope that these decisions clearly show our commitment to creating shareholder value through not only business growth but also through capital allocation decisions that are beneficial to our shareholders. And that our shareholders will share our confidence in sustained growth in our business and the shareholder value.

Right now, we are in a difficult operating environment. However, as you heard from today's decisions, we are doing our best to secure long-term growth momentum through organic and inorganic ways.

We hope that our long-term shareholders will continue to support our effort as we try to consistently enhanced company value in a sustainable manner.

Thank you very much today and I really appreciate your time today. Thank you.