[Black Text: Host, Nicole Huesman]

Welcome to Open Source Voices. My name is Nicole Huesman.

Today, we'll take a look at the emergence of new form factors in computing devices—specifically, the evolution of laptops—with our guests, Lakshmi, Senior Engineering Manager at Intel, and Conrad Lo, Product Manager at Google. Lakshmi, Conrad, thanks for joining us!

Lakshmi, can you start us off by introducing yourself and telling us what you do at Intel.
So, Nicole, I manage a software and systems integration team at Bangalore, India that integrates Intel silicon on Chromebooks. I have been privileged to be part of the Intel journey right from introducing the first Intel-based Chromebook and along this journey we are here at launching the first detachable Chromebook a few weeks back, so I'm here to see many more first things on Chrome.

Conrad, tell us a little bit about yourself and what you do at Google.
I'm a product manager on the Chrome OS platform team and that basically means that I work on everything except the user interface. So our team works on the hardware, the reference design, component selection, ownerships with ODMs, OEMs, and SSD vendors like Intel. So, we're responsible for various layers in the software stack, from the kernel down to the firmware and we also work on different subsystems like touch, media, graphics, connectivity, power and performance.

Q: So, Lakshmi, if there's one thing that we can count on in the tech industry, it's the state of constant change. You mentioned the evolution of Chromebooks and the first detachable Chromebook. Can you tell us a little bit about what precipitated that in the market?
Consumer behavior is changing and so are the form factors, particularly the PC laptops, are evolving in new directions to support these new consumer behaviors. If you look at the traditional PC market, the year-on-year growth has been flat. As per the IDC data, the US grew modestly after six quarters of negative growth. But if you observe the overall tablet space, which includes both tablets and detachables, unit volume almost declined 11.7%. However just the detachables space within tablets grew 15%. So, detachables are in the market now, and that's what consumers are looking for.

Q: Can you talk to us more about detachables, for those who may not be as familiar with them?
Detachables are a new emerging category in the laptops space – devices that can operate both in a normal laptop mode as well as a display-only tablet mode. It gives consumers a full creation experience in the regular laptop mode with all the capability that comes along with it. But then the consumer wants to just consume data—say, she wants to listen to music, or he wants to play a movie on NetFlix—then it gives them the ability to detach the display and use it like a tablet. This when combined with the ability to run Android apps gives the consumer a rich option in terms of usage experiences.

If you look at the last five year projection from IDC for the PC market, detachables are expected to double their unit sales by 2021 when compared with 2016 rising to 11.6% of the market. It is exciting to participate in a new product category like that.

Q: So, the teams are really charting this new territory. Conrad, can you tell us what inspires you, or excites you, most about this new device?
As Lakshmi mentioned, it's a really exciting market for us, and with the launch of the first Chromebook detachable, we're bringing the speed, simplicity and security of Chrome OS to a versatile and mobile device. It's great when you want to be productive. It comes with a desktop-class browser, a full-sized keyboard and trackpad, it comes with a stylus, and it supports a wide range of different viewing angles, and for the times when you want to consume content, it offers a large, high-resolution display, millions of Android apps to choose from, and a premium, industrial design. And, of course, like all Chromebooks, it boots in … it comes with over ten hours of battery life, and it has anti-virus protection built-in. So, all of this is coupled with the latest Intel silicon, so the device provides great performance.

Q: We'd love to take a behind-the-scenes look at the joint Google and Intel team that really helped to usher in this first detachable Chromebook. Lakshmi, can you talk to us about some of the challenges that the team encountered and how they fought through that adversity?
The earliest challenge we faced was in getting software ready in time for the hardware ready to power on. Since we were designing a new hardware platform category, hardware availability was supposed to be later in the development life cycle. We wanted to develop software early and get it ready for hardware because if you have too many variables at one point in time then it's very hard to have a power on and get your product out. So, we wanted to have the software ready. We developed Chrome software on a different hardware platform by tweaking the platform to make it amenable for Chrome. This enabled us to have the software ready ahead of the hardware. So, it was first of its kind when we tweaked the existing hardware to make it amenable for Chrome.

Then, at a later point in the project, we realized that the weight of the lid in the detached mode was not all that great. It was higher than what we had anticipated and wasn't an optimal experience from a user perspective. So we re-looked at the hardware design and optimized the battery size (reduced the battery weight) by enabling additional power optimizations thus bringing the overall weight under control. This essentially gave us the best power envelope in an Intel notebook in this device thanks to the suspend-to-idle framework we have productized. So, it was a tough journey but when we saw the product launched and the market review, it was amazing.

The next thing was the new Intel hardware-based camera is a key highlight of this platform overall. This co-engineering along with the Google team in the camera space was the first of its type. We had to develop the kernel drivers and upstream them, we had to work with Google on the Userland HAL infrastructure under a very tight schedule. The team pulled it off,

and this remarkable feature is right on schedule and the new camera is a highlight in this category. This also provides us with a new foundation for upcoming platforms.

Q: Conrad, from your perspective, what were some of the most rewarding aspects about the collaboration between the Google and Intel teams?
I think Intel and Google were fairly aligned on the detachable vision from the get-go, so that actually set the foundation for a really collaborative, fruitful, co-working model. Even though our core team was split across three different geographies, for example, time zone was rarely ever an issue. There were a few areas where we broke new ground. This is our first device with a high-resolution MP camera, as Lakshmi was talking about. So, we brought together the Intel and Google teams for a series of different camps where the teams sat side by side for a couple weeks to work together. It was also the first X86 Chromebook with a design such that the Motherboard and the battery were both behind the panel so, naturally, they're the most important considerations, so we spent a lot of time … and finally, it was also the first Chromebook with a detachable keyboard and base, so spent a lot of energy stress testing the … mechanism as well as optimizing the software stack …

Q: Before we close, are there any other things either of you would like to add?
[Lakshmi] We have been working closely with Google and partners like HP over multiple generation of platforms now. It was a pleasure to co-engineer this platform with them – right from the early hardware design stage for this new form factor to the software aspects of this multi-faceted platform. We are sure consumers are going to like what we have built here!

[Conrad] Intel's been a fantastic partner, and we've built many generations of devices together, and we look forward to building more new devices with new form factors and new hardware capabilities so we can push the envelope and bring new features to the Chromebook ecosystem and for our end users. So, I'm looking forward to all of the future work we'll be doing together.

Q: Absolutely! Well, we are really looking forward to hearing more from the team and what you're working on next. Lakshmi, Conrad, thanks so much for joining us today—it was an absolute pleasure to talk to both of you and to get a behind-the-scenes look at the teams that worked on the first detachable Chromebook. We're looking forward to talking to you again in the future.

Until next time. Thanks for listening.