S1 EP2 - mGig Industry Trends | Marvell Technology

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Ron Cates, Senior Director of Marketing from the PHY Business Unit discusses PHY Technology's role in networking data infrastructure with podcast host Chris Banuelos. Ron discusses the latest trends in mGig technology and in light of the work from home environment, where mGig is going. Stay tuned to hear more about specific customer pain points and Marvell's mGig solutions. Click the link below to find Ron's article "EMI and New-Generation mGig Ethernet Links" published in Electronic Design featuring insights into mGig, why electromagnetic interference (EMI) is a thread to mGig transceivers and the three algorithms that can help mitigate EMI.

Speaker
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Christopher Banuelos 00:04
Welcome to the Marvell Essential Technology podcast. I'm your host, Chris Banuelos. On today's episode, I'm with Ron Cates, Senior Director of Marketing from our PHY business unit. And today we're discussing PHY technology's role in networking data infrastructure, Marvell's mGig solutions and a recent article Ron published in Electronic Design titled, "EMI and New-Generation mGig Ethernet Links." You know, Ron, what I've discovered over this last year is that in working from home and working with a big team of individuals, is nothing's perfect. And what I mean by that is, you know, sometimes there's someone at the front door delivering a package, you got to take the dog out, someone's helping their child with at-home learning. And despite those challenges, we can still remain productive.

Ron Cates 00:54
Well, yes. And you know, the one thing I have to say is that I think that certain aspects of our experience during the pandemic are fixtures that are going to stay with us for quite a while. You know, Marvell and many other high tech companies are going to this hybrid model, where people are going to be allowed to work several days a week at home. And that coincidently puts tremendous strain on a company's networking infrastructure. Because it means that every meeting is a Zoom meeting. And every conference room now has to be upgraded, to be able to accommodate video teleconferencing. And all that extra bandwidth of video data means that every enterprise out there is going to have to upgrade its camera equipment, and its backbone and other aspects of its enterprise network in order to be able to handle all that extra data.

Christopher Banuelos 02:01
This is a great segue into our discussion. Can we go over the definition of a PHY? And can you also explain to our audience what is its role in networking data infrastructure?

Ron Cates 02:12
Right, so PHY, which is P, H, Y. A lot of people think that that is an acronym of some sort. But in reality, it's a shortening of the word physical. And what PHYs are — really transceiver devices that allow communications over standard Ethernet cabling. I'm sure you've seen standard Ethernet cabling in the enterprise. They're usually blue wires but although sometimes I've seen white and yellow, but what characterizes them is the fact that they have these plastic RJ45 connectors.

Christopher Banuelos 02:55
So Ron, this is the same exact Ethernet cable that's plugged into my wall at home, is that correct?

Ron Cates 03:00
That's right, exactly. And in many cases, you know, into a similar female receptacle in your laptop or desktop computer. So those are pretty ubiquitous things. And what the copper PHYs do is that they, essentially, are interface devices, because a little known fact is that the signals that go on those Ethernet cables are analog in nature. And yet the things that need to be communicated with — computers, switches, firewalls, servers, things of that nature — are fundamentally digital. And so you have to have a device that converts between the digital world of the computer or server, and the analog signals that flow on these copper cables that that have these RJ45 connectors on them. And that is what a PHY does. Now PHYs rely very heavily on IEEE standards in order to assure interoperability between devices and vendors, you know, they say that a network of one is completely useless. But a network of many is extremely useful. And the only way to make it a network of many is if everybody talks the same language. So the IEEE and its standardization committee have created documents that all the vendors adhere to in order to make sure that all of these PHYs talk to each other with the same kind of protocols. And it's very important that vendors like Marvell adhere to those standards.

Christopher Banuelos 04:45
Ron, can you imagine a world where those standards didn't exist?

Ron Cates 04:49
Not only can I imagine a world like that, I lived through a world like that because, you know, back in the early 70s there were a whole bunch of standards were which were competing with each other, and vying for dominance. And it took quite a few years for Ethernet to actually become the dominant standard because prior to that, it was just like what you described. A lot of vendors had their own proprietary systems and networks did not talk to each other. And it led to some interesting problems.

Christopher Banuelos 05:26
Very often, there's this term in the enterprise and data center networking space: mGig. Can you tell me what mGig is and what are the trends driving it?

Ron Cates 05:36
Sure. So mGig actually stands for multi gigabit. It's a term used to refer to devices that are capable of data rates faster than the one gigabit data rate that most unshielded twisted pair Ethernet cable is used for today. And multi gigabit actually comes in several discrete speeds or data rates. And the most typically used ones are 2.5 gig, five gig and 10 gig. So if you've got a PHY device or a switch device that's capable of those higher data rates, 2.5, 5 and 10, you can advertise your equipment as mGig compliant. Now they were originally developed to address the needs of advanced Wi Fi access points. As Wi Fi became more popular, more advanced access points were developed and they need to have uplinks with greater than one G speeds. And here I'm referring to things like Wi Fi 6, maybe you've heard that or Wi Fi 6E. Now, Wi Fi 7 is going to be standardized pretty soon. So that's sort of what got mGig its start: the need to provide an uplink to those data hungry access points. But the technology is now proliferating into many other applications, including home routers, and indoor cellular base stations, modems, things of that nature. So I think that you know because of many networks and pieces of equipment on networks have an almost insatiable need for more bandwidth. And because mGig by and large reutilizes the same installed cable base that is in the enterprise today without the need to upgrade the cabling itself, I think it's going to become more and more popular as time goes on.

Christopher Banuelos 07:50
In light of working from home and being in this environment where there are multiple devices using one network. Where do you see this technology going?

Ron Cates 08:00
It's fair to say that as more people work from home, their bandwidth requirements become larger. And there are a bunch of fiber based technologies and cable modem based technologies that are going to meet the need to bring more data rate into the house. But that brings up an interesting question, which is once it's in the house, how does it get distributed throughout the house? And that's why people that are in the router and modem business are including mGig ports on their equipment in order to be able to take the higher speed that comes out of the street, say, you know, whether it be an optical fiber or a coaxial cable, and allow for proper distribution at these higher data rates throughout the home. And that could be something that goes to a Wi Fi device in the house, sometimes something that goes to a network storage device that requires higher data rates, and eventually even all the way to the client computer. Because there are some client computers already and more in the future that will have these mGig ports available.

Christopher Banuelos 09:19
and how do Marvell solutions address the need for mGig?

Ron Cates 09:24
Well, you know, we have a very broad portfolio of mGig devices for both high density wiring closets switches, as well as for client devices such as, for example, Wi Fi access points. The key pain point in the past has been that the chip itself that provides this additional amount of bandwidth had to dissipate significantly higher power than its predecessor. And that meant no big heat savings and extra cost in the compliant equipment. But the beautiful thing here is that we're able to capitalize on some significant advances in semiconductor lithography of late that have brought that power dissipation number down by orders of magnitude. And so today, I think we're getting to a point where we're able to satisfy the needs of almost any piece of equipment, even ones that don't have fans and heat sinks in there. And that trend is just going to continue in the future as better lithography becomes available.

Christopher Banuelos 10:44
Can you walk through why it is so important to have a low power consumption?

Ron Cates 10:48
Well, for several reasons. Number one, it costs more money, of course, to power up a device that dissipates more power, cost of electricity, and may seem trivial, but when you have a very large switch with 46, or 48, or 40, or 96 ports on there. And each port dissipates several watts of power that adds up and the optics associated with that device increases. But the other more insidious thing, as I mentioned before, is that higher power means that the design of the device itself has to accommodate the thermal issues associated with removing the heat from the innards of the device. And that means bulky, large heat sinks and fans and things that you'd rather avoid if you had access to a technology that was lower power.

Christopher Banuelos 11:53
And, Ron, what are some of the specific customer pain points that you've observed?

Ron Cates 11:58
Well, what one pain point that I really should address, concerns the fact that Ethernet in general, but mGig devices, in particular, have an issue and that the frequency band that they use, sometimes overlaps with the frequencies that are used by other radio frequencies, radio frequency emitters and the environment. And you know, these these cables that we were talking about, you know, that's an unshielded cable. You take one of these cables, and you take a pocket knife to it, and you cut it open and peel it apart and you'll see that inside

is really nothing more than four twisted pair wires, there's no shield or anything on most of these cables. And as a result, a lengthy strand of that cable, typically 100 meters in an enterprise environment, is essentially an antenna that picks up all kinds of stray electromagnetic interference. And it is the case that here at Marvell, we were utilizing the DSP Engine inside of our PHY to come up with some really creative algorithms, digital signal processing algorithms that identify and mitigate those interferes so that they don't corrupt the data on the Ethernet cable.

Christopher Banuelos 13:44
Can these Ethernet cables pick up signals from cell phones or other connected devices?

Ron Cates 13:49
Of course, it can pick up your signals from a cell phone. Now, the good news is that most emitters that we're familiar with, like for example, cell phones, or Wi Fi or Bluetooth. Even things like baby monitors and microwave ovens and other kind of stuff around the house. They're all in the multi gigahertz range. So they emit frequencies between 1.8 to 5 gigahertz and that turns out to be outside of the band of interest for an Ethernet transceiver, which is somewhere between zero and 400 megahertz. However, there are plenty of emitters out there that fall directly into that zero to 400 megahertz band, and I'm thinking here of things like TV stations and radio stations and ham radio and police radio and taxi cabs. A lot of people use the two meter band and in a meter like that can definitely interfere with these kinds of Ethernet transmissions. And some of them can be fleeting, like, for example, you have a taxicab that drives by and all of a sudden your data goes away and, and he drives away and you say, Hey, what happened. So, so having the ability to automatically detect these kinds of RF emitters and notch out their energy before it becomes a problem in the transmission of digital data on your Ethernet cable is a very, very important benefit that that we have in our PHYs.

Christopher Banuelos 15:48
One thing I'm really excited to share with our listeners is that you recently published an article in Electronic Design and you talk about the different challenges that EMI presents in mGig transceivers, what are some of the relevant topics within the article?

Ron Cates 16:03
Well, you know, as we just talked, this electromagnetic interference, or EMI really does play havoc on on Ethernet networks. And what the article talks about is, well presents a comparative analysis of the various algorithms that are available out there to mitigate these types of interference, and presents, you know, a bunch of charts and graphs that compare the effectiveness of the various algorithms and points to ones that are more optimal and more effective than others. And so it's highly technical. And for those who are interested in for those who are interested in learning more, I advise them to read up on it. It's, it's published in Electronic Design.

Christopher Banuelos 17:01
And we'll definitely link the article in the podcast description below. Ron, let's wrap up with what excites you most about networking technology today? And where do you think it's headed?

Ron Cates 17:15
Well to me, you know, I, I started my career as an analog design engineer. And one of my first assignments after graduate school was to develop high speed signal transmission type systems, and at the time there, there wasn't really a lot of digital signal processing that one could get hold of. And so a lot of my job was to make sure that the that the channel itself is highly optimized and free of disk continuities and other kinds of artifacts that create reflections and problems for data transmission. But when I learned about what DSP technology or digital signal processing technology can do, and how it can squeeze every bit of available performance, from these various channels, it really did excite me. It is the case that a lot of the cables that we were talking about, were never designed to carry these kinds of high speed signals. And yet, applying this digital signal processing technology to them, allows them to work reliably and carry these high speed signals as well. So understanding the these DSP algorithms and how they work is a is a fascinating thing for me. Now, you asked

where the technology is going and and to our earlier conversation, the increasingly ubiquitous nature of the Ethernet protocol, which has historically taken on challenges from many alternative solutions, but has emerged as the dominant interoperable, flexible and scalable networking solution has created a situation where now it's penetrating many other applications beyond just enterprise networking, for example, telephony, and cable networks, automotive networking, and variety of industrial applications that are recognizing that jumping on the Ethernet bandwagon for interoperability, and low cost is really the way to go. So I think that Ethernet as a protocol, is just going to continue to dominate networking in all of its aspects, whether it's the Internet of Things, or inside of a car. Various, like I said, industrial applications like robotics. So that's exciting. You know, being able to see something that continues to emerge as a very useful protocol.

C Christopher Banuelos 20:09
Ron, just want to say thank you again for participating in today's episode. For those that are listening, check out Ron's article in the description below. And Ron, thank you again. Thank you, Chris. Thank you for listening to the Marvell Essential Technology podcast. As always, please feel free to visit our website to learn more, and we'll see you on the next episode.