



Podcast Transcript

**Stefan Dyckerhoff, Vice President/General Manager, Mid-Range Business
Cisco Aggregation Services Router Innovators:
Will Eatherton, Director, Software Engineering, Distinguished Engineer;
Michael Beesley, Chief Technology Officer, Mid-Range Business Unit
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Peter Shaplen: At first the differences between Cisco innovators Will Eatherton and Michael Beesley might appear more striking than are their similarities. Eatherton, a director of software engineering and a distinguished engineer, appears reflective and reserved; what he admits is a Missouri farm boy's deferential attitude of put up or shut up. Beesley, the chief technology officer for the mid-range business unit is boisterous and embracing. They josh and poke fun at those differences, but their mutual admiration is unmistakable. In their lab at Cisco's San Jose campus, Eatherton offered a faint, almost wry smile while indulgently allowing Beesley, briefly, to take center stage.

Michael Beesley: Collaboration is funny. In my opinion it's like dancing the waltz, where you need two active partners with a certain amount of dynamic tension against each other but a willingness to go with each other.

Peter Shaplen: Both Eatherton and Beesley credit Stefan Dyckerhoff, Cisco's vice president and general manager of the mid-range routing business for giving them support, even when others had profound doubts.

Stefan Dyckerhoff: Well being a manager of folks like Mike and Will is an interesting challenge. It's a little bit like riding a wild horse, maybe. You're never fully in control but you're trying to steer it in the right direction.

Peter Shaplen: By his own acknowledgement, Eatherton and Beesley are individualists who shared a passion for making something better and found, in one another, the opportunity to create something remarkable, the aggregation services router ASR-1000.

Stefan Dyckerhoff: You call the ASR-1000 a router but it's much more than that. It's

the service delivery vehicle for customers and the service that they want to deploy over the network.

Michael Beesley: I also want to be clear that it's not one product. It is a whole family of products that spans a very broad market. It spans from small enterprise customers to the biggest service provider customers. In today's world, that's very important because it equals operational simplicity for our customers, and capital expenditure efficiency in the customer, because they can buy one widget, whether it be an IO card or an engine or a control plane. They can spare that in one depot or several depots around the world, and when they need to deploy it, they can deploy it into any number of different routers inside the family that they've maybe deployed in numbers of 10 or 20,000.

Peter Shaplen: The ASR-1000 was five years in the making, ultimately involving a team of more than 450 engineers. For Eatherton, then just a newly minted technical leader, the first step began at a company meeting.

Will Eatherton: So I was sitting in an All-Hands in mid-2002 hearing about how we were going to need to be able to put all the features very quickly across all the routers, and up until then we'd been doing it, you know every group including my own, CRS-1. I had been thinking very much about their own technologies. So I started thinking how could at a packet processing level, which was my expertise, how can we make it so that we can scale performance-wise, services security and really be able to support very quickly this broad set of features? And I saw then it was going to require a lot of changes to how we'd been doing things in the past.

Peter Shaplen: As Eatherton explains, he still had what he called his day job working on the CRS – 1 router.

Will Eatherton: It was a meager beginning. It was just myself, a couple of people – a lot of them were technical leaders, distinguished engineers, having these meetings. And the key thing was we did see that the requirements were very difficult and diverse but we could start to make a single architecture.

Peter Shaplen: If Eatherton and his colleagues began in collaboration, Beesley began

in a more solitary mode based on what he admits was sheer frustration.

Michael Beesley: I put a blank piece of paper on the table and I said on one side, what does the customer need, and on the other side, how would I build it using modern technology, software and silicon? How would I build it such that it is as close to perfectly as I could match what they need. And then I take a second piece of paper and said if any company was to build it, would it be a viable business such that it's a win/win for the vendor and the customer, or would it be a business anchor for the vendor? I am a technologist, but I know a little bit about business. Quick evaluation says for the vendor it's a good return. For the customer, it's going to be compelling. And I went forth from there.

Peter Shaplen: Working independently, Eatherton and the engineers, already numbering perhaps 100, were designing the quantum flow processor.

Will Eatherton: At Cisco innovation means being able to pull together folks across a variety of backgrounds and groups and being able to produce something quickly. You can't just go off into your own little niche area and produce something great; to do something like the quantum flow processor means really being able to look across multiple groups and leverage that.

Peter Shaplen: Meanwhile Beesley was developing the architecture that could work with nothing less viable – and certainly with nothing yet available at Cisco.

Michael Beesley: I would say the answer is that unbeknownst to each other, we came to the same spot from two different directions. When I architected the ASR at home at my desk, I just drew a box and said packet processor. I didn't really define what was inside that box, but I did define what it should do and then said I'll figure that out later. I then met Will Eatherton several months later and he said I have a chip called the quantum flow processor, and it's looking for a product. And I go well I need a chip for a product. Let's compare notes.

Peter Shaplen: The result of this collaboration has been the culmination of hundreds of years of aggregated work.

Will Eatherton: At Cisco we were able to solve this problem because we had several things coming together. We had the view across all these different networks and deployments. We had all these variety of products at different performance points and we were also doing the complete stack of technology, from the software all the way down to the silicon, including doing our own libraries in the lowest levels of transistor pushing for the chips. It really required the expertise and understanding we had across the markets as well as the control of doing all of the technology.

Michael Beesley: So with regard to what ASR can do and does do today as compared to the industry and all routers on the market today is it is at least an order of magnitude in straight speed. Bandwidth. How many bits can go through the router, which in today's video enabled world is a very big deal.

Peter Shaplen: Eatherton speculates it is so advanced that no other company could replicate it in less than 5 years of work. The result?

Will Eatherton: So many times when companies introduce a new router they come out with a core routing feature set, getting a packet from A to B, doing some basic classification, these kind of things. ASR as it comes out is covering a feature set that's representative of everything that you need to be able to do in networking. Not all the features are there day one, but the capabilities of the quantum flow processor are exercised across the board for monitoring, fire walling, regular expression matching. All of these things are being done from day one and this is not something I've ever seen done before.

Peter Shaplen: For Beesley, the advantages of quantum flow processor include its speed, flexibility and it's green.

Michael Beesley: There's bandwidth and packets. The QFP also is an order of magnitude improvement on packet performance. It can apply any feature you like, but most importantly, it can provide and apply the standard set of features, which might be QS, ACLs, Unicast, Multicast, Netflow, policy based routing. That's a standard set of services that a lot of customers would just apply all the time. It can first of all do all those

features innately, organically, inside of itself. It doesn't need any engines or service blades or accelerators that are very expensive that suck a lot of power that are hard to manage. It can do it all itself, which is remarkable all by itself.

Peter Shaplen: Michael Beeseley can claim responsibility for 15 other routers in his career. He is most proud of the ASR-1000 because he thinks it will be the standard for decades.

Michael Beesley: I want it to be right today, but I want the same choices to be right 10 or 15 years from now because I can't change whilst technically they can. If you deploy a 5000 node network, which these modern networks as IP today carries of all the bandwidth ever transmitted around the globe including phone, satellite, GPS, etcetera, IP, V4 or V6 enabled traffic, already accounts for 99.999% of every bit of information electronically transmitted around the globe.

Peter Shaplen: For Beesley and Eatherton, this is just the beginning. Eatherton believes it is only a beginning.

Will Eatherton: I believe that the quantum flow processor will be viewed as when the architecture really came together, and that was the platform then for the next , I believe it'll be used for 15, 20 years. It will evolve; we're already working on the next generation but it's going to be something where folks look that's when we finally got it right.

Peter Shaplen: Michael Beesley says he won't be around for many more innovations. He's leaving that to his younger colleague and friend, yet another opportunity for these two innovators to find a moment to savor the ASR-1000 and what they have done together.

Michael Beesley: I don't think, to be honest, being realistic, that I'll still be in the game 20 years later. Rather, I'll be off in some retirement home but I'll be calling Will, saying how is my baby doing. And what has the last 20 years looked like. And he's going to say, "Michael you know what, as ever, as always, you were right. We changed the world. "

Will Eatherton: I'll drive by and visit you in the old folks home.

Michael Beesley: Well thank you very much. I appreciate that.

Pether Shaplen: With the innovators in San Jose California, I'm Peter Shaplen for Cisco.