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The Evolution of the WAN – best of private networks and public Internet

Guest Speaker: Amit Sinha Roy

Vice President, TATA Communications

Manek Dubash

Welcome to NetEvents. And for those who've not been here before, a very special welcome. Good to see some friendly new faces here too. My name's Manek Dubash and I'm going to be your MC for the next couple of days. I think you'd agree there's probably too many pictures of me in that slideshow. Take them out, please.

Okay. So let me first of all lay out the format of what we're going to do today. For those of you who've not been here before, what we do is in the morning we're going to be talking about the issues of the day, SDN, cloud, so on and so forth, 100-gig networking. And in the afternoon there'll be meetings between vendors, press and analysts. And in the evening we'll go for dinner. And tomorrow we do the same thing again apart from the dinner part. Okay? Quite simple really. And hopefully you'll get some value from that. Hopefully you'll get some headlines and some useful information.

Talking of useful information, and we've got some press here from over 12 countries, by the way. There's a small change in the agenda. Unfortunately for reasons of ill health, Amol Mitra from HP is unable to be here. So we've rejigged the agenda just a little bit. And the first keynote is going to be by Amit Sinha Roy, who's the Vice President of TATA Communications, talking about evolution of the WAN. And we're going to have him coming up first. And then we're going to move on to a short interview with him and then to the first round table session. And then after that we just follow the program. Okay?

So I think that's the end of the chat from me. It delights me hugely to welcome Amit Sinha Roy, Vice President of TATA Communications, he knows what he's talking about, the evolution of the WAN.

Amit Sinha Roy

Thank you for the warm welcome, Manek, and good morning. Welcome to Singapore. And of course it's always a pleasure to be at NetEvents. So much of interaction, networking, learning and of course making friends.

But first, the topic at hand. How many of us here believe that the internet, as it is today, is fine and good enough for critical business networking for enterprise? Nobody's putting up their hands. That's not right. The internet has come a long way. It is something that we use every day. It is something that is a part of our lives, a part of our social as well as professional lives. So how is it that we could potentially extract more value out of the internet, make it more business ready? That's basically what we're going to be talking about today.

Everyone agrees, be it the reputed analysts such as Gartner, Ovum, as well as our private studies that we have done within TATA Communications, that enterprise is moving to the cloud and to a hybrid cloud environment. And the issues that are facing the enterprise CIOs is mostly around network security and the service-level agreements. And the evolution of the hybrid cloud, where the private data is secure and then there are applications that we want to open up to the public, is a way of life that is not going to be reversed.

So we did a study with some of the CIOs in the large enterprise and other related companies. And essentially we marked them on was the expectation exceeded? Were they met or were they not met, across various parameters, across data access, improved security, revenue and, of course, the big one, which is cost-effectiveness. And what we came up was that most of them said that expectations are met but it's not really getting exceeded, which is where everyone wants to be in terms of deploying a network solution.

If we also look at the way the applications are evolving, clearly the applications are now across the private, public and the internal systems. So this is something which is, again, a given. And each of these areas today are optimised for delivering certain application parameters and certain application functionality and features, access, security and so on and so forth, which allows the companies to have a best-in-class, best-of-breed kind of applications. Now that would also mean that there is an interaction across each of these areas, be it legacy ERP going to the private cloud. We have SharePoint where we store our documents, our policies, our regulation and so on and so forth. And then a public cloud, where we're running web hosting, payroll and so on and so forth. So we know this whole nine yards over here.

So essentially what is happening is this is a mix that is constantly changing based on business needs, based on applications as they evolve, based on regulatory reasons and so on and so forth. Now, if the CIO were to be looking at what are the top concerns, clearly the concerns that are coming out are around the network performance, security,

how do you keep pace with so many service providers who have very innovative platforms which we would like to use and adopt? And obviously that leads to many suppliers and then, of course, the number of providers that one needs to connect to.

Another way of looking at it is just the way the applications are there. There is a connectivity issue which is coming up across the public cloud, the private cloud and in house. And this complexity is actually increasing with mobility. As users become mobile, as applications are moving off into BYOD, into a global workforce, work from home, work on the move, work from planes, right? There's WiFi on the plan nowadays. The last bastion of privacy is gone. So that is adding its complexities as well to this whole mix.

So the data flows now have become very complicated, which is moving across internet, multipoint networks, across MPLS, Ethernet in the private networks, and then of course in-house and point to point, leading to sometimes traffic snarl-ups. So this is something which is going to create issues in terms of application availability, in terms of user experience, which is essentially what the CIO is looking to deliver. So there could be bottlenecks which come up and even traffic flows, complex traffic flows, etc., which create issues for the users and therefore take away from the user experience.

Clearly if we look at the internet as it has become today, we can no longer say it is something for information, which is used, which has become integrated with business. So we are now saying the internet has actually become business-critical. It's a business driver. No longer is it optional; it is a must-have. So public cloud mobility are realities, both in terms of application availability as well as in terms of being able to access those applications while on the move.

So looking at it from the perspective of how is it all coming together, clearly the hybrid cloud concept is something which was earlier talked about but wasn't really on the roadmap of most enterprise and service providers but has become a reality today. There is no getting away from the hybrid cloud.

Now the hybrid cloud, while it seems simple, and of course all the analysts say that this is the way it is going to be and is going to be the new normal for the next generation, that's what Partner says, hybrid is the new WAN, standardising hybrid WAN offerings, combining MPLS, internet, VPN and internet services are now the default WAN architecture. So it's pretty much become the default in terms of how enterprises are deploying their connectivity solutions.

So how is it that this is actually happening? So there is the legacy out way and methodology that is being followed. And some of the service providers would be looking at it like how do we deliver these critical systems? It would be potentially putting a wrapper round existing services and taking it and [veering] internet access around a legacy MPLS network. So is that the most optimum way of deploying a solution that can cut across network, cut across geographies, cut across devices, access points, information storage?

So one of the things that I would urge you, one of the videos which is there on YouTube, how many of you have heard of Bob Metcalfe? Yes, I think almost everyone. So he is the inventor of the internet. And there is a wonderful video which is there on YouTube, where he talked about the Third Network. And of course, we have NetEvents anchoring that. And it's about an eight-minute video so I don't have the time to play it today, but I would urge you all to have a look at that video. And he talks about how the network has evolved. He talks about this Third Network, which I've been trying to build up to so far.

So how has TATA Communications actually tried to come and create a solution which is different, which is more optimised, which is actually moving away from some of the legacy infrastructure while, of course, leveraging it, but not just repackaging it? So the way TATA Communications actually put together this network is, and we call it IZO, is it is a network enablement for wide area networks and for cloud.

So what we have done is we have created a solution which is leveraging not only the TATA Communications network which is there, but also in partnership with over 20 service providers, and that number is increasing, which allow us to provide to our end customers a deterministic routing for the data over the public internet. So it is almost like delivering MPLS or Ethernet capabilities over the public internet.

So it actually has the ability to deliver services, and I will cover them off very quickly. I don't want to do too much of hard sell here, just to cover some of the solutions that are possible. And then of course we could have detailed discussions later over the coffee breaks or the lunch breaks or the meetings that are set up in the afternoon. But essentially if we look at the service offerings that are there in IZO, primarily there are three. One is the IZO Internet WAN. One is IZO Public. And one is IZO Private. And I will cover these off very quickly.

Why have they been created and what are the use cases that they are actually delivering to? We go back to the earlier questions that's on the minds of every CIO, internet performance, security, network performance, so on and so forth. So if we look at IZO Public, it is essentially a service that is available to cloud providers. It prioritises critical applications. It runs over the internet and it allows [SLE]-backed performance which is available to the users using the technologies that TATA has deployed not only on our network but in partnership with 20 other service providers. And it is available in multiple locations across the world.

The IZO Internet WAN is focused towards enterprise, global enterprise, who's operating across multiple locations, global locations, and would like to have MPLS-like performance as well as security across their various offices which are connected on internet. So it is ability to deliver the enterprise-class WAN services over the internet, leveraging not only our network but also the partner networks across the globe. And it allows not only the ability to have this performance but also it gives a very fast time to installation because it is actually using internet connection so it doesn't require dedicated cable laying and connectivity to the office premises.

IZO Private is where we allow our customers to connect through private connectivity, so it could be Ethernet MPLS connections, into TATA Communications. Now imagine, most of the enterprise customers today are using cloud services across it could be the Microsoft Azure platform, the Google Cloud platform, it could be Amazon Web Services, and sometimes it's a combination thereof. Typically customers would have to have, if they wanted dedicated, secure access, they would have to have the connectivity almost last mile to the cloud provider.

What TATA Communications has done is that we've, in partnership with Amazon through the Direct Connect program, Microsoft through the ExpressRoute program, we have connected the last mile into all of these service providers. And then we have the connectivity that we can provide to our enterprise customers, who then, with a single connection, can access multiple cloud services providers in a secure and highly performance-oriented way. So that is something which we offer in the IZO Private.

So essentially, if we look at private connectivity to datacentres, we mentioned about the key cloud service providers, but nothing stops, of course, to also connect other datacentres that enterprise may be using and accessing. So it allows connectivity across multiple locations where we have datacentres of our own as well as of our partners already connected.

And then essentially what it does is it allows us to provide a predictable simplified access, which is seamless and secure, to these cloud service providers. What earlier would have required multiple relationships, multiple connections and connectivity and a lot of complexity in terms of setting it up in order to access multiple solutions and service providers in a seamless way.

So essentially what we say, and this is a bit of the marketing jargon, is the win-win man, everybody's network cloud and basically how you can leverage a single service provider for the cloud ecosystem across the public/private internet WAN. And it allows enterprise and service providers to use the network to reach more cloud providers across multiple locations, of course faster deployments and better cost performance.

What are the kind of applications that are typically the use cases? If we look at email and streaming video, enterprise applications, then those are less latency issues. So if you have a little bit of latency, it obviously doesn't matter on email if it comes in a few seconds. But if there's real-time video collaboration over virtual desktop, then it does matter. So with these solutions, what we have done is the IZO Internet WAN is actually able to take these use cases and deliver a seamless experience for the end user and for the enterprise across these using the technologies that I just described.

So just a little bit about some of the partnerships that are there in place. I talked about most of them so I won't spend much time on this slide. In terms of the service coverage, it is right now available in 34 countries and 500 cities and we're looking at increasing this footprint dramatically over this year and next year. And some interesting statistics in terms of the initial rollout, it covers almost 85% of the world's GDP. So that's an important statistic for enterprise. We want to reach out to

customers and 80% of the world population. And we plan to extend to about 100 countries by the end of next year.

This is a little bit about TATA Communications. We're a tier-one ISP service provider. We have created more than 50 datacentres, over 200 POPs and 500 ISP customers and a huge number of petabytes travel across the network, which is essentially almost 24% of the global internet routing is over our network. So that's the scale of operations that we have, backed by a passion for our customers. So most of our customers, 82%, and it's almost all, they're very satisfied or extremely satisfied with the experience that they have with us.

And if we look at the type of security measures that we have deployed in our network, it allows us to have 0% spam, phishing and malware, so that's, I think, something commendable. And customer satisfaction is much higher than the industry average.

So when we presented this at launch, the analysts had some good things to say about the IZO platform. So they're up here so I'm not going to read it out. But essentially we had Joel Stradling from Current Analysis and Nav from IDC talk about the solution. And that was very, very positive things they had to say.

So to wrap up the presentation, the question is are you ready to deploy the Third Network, to build your network cloud? And we are ready with a solution available from TATA Communications, in partnership with service providers and cloud providers.

And with that, I'll end the presentation. And I believe we have a discussion that we'll get into right now. Thank you very much.

Mike Fratto – Principal Analyst, Enterprise Network Systems, Current Analysis

Thanks, Amit. Very interesting service offering as an alternative to wide-area network. And I think you hit all the high points of what TATA is going with IZO.

I just had a couple of questions. Then I want to throw it out to the audience. If you have any questions, just raise your hand and we'll get those going as well. So first of all, obviously there are a lot of WAN service providers. They're providing value-added services in addition to just connectivity. So can you talk a little bit about what you see are the main competitors, either technology-wise or service-wise, to IZO.

Amit Sinha Roy

So clearly there is no single competitor who spans across all of these service offerings and capabilities. There would be a competitor in each of the areas, so, for example, the internet itself in a way is a competitor, because internet provides access to every service that is available. But if one wants to have a deterministic SLA-driven routing with specific latencies that are guaranteed, then the question comes up, who is the competitor? So the competitor could be the private network connections, the Ethernet and the MPLS, which also we have. It's not that we don't have them. We compete with some of our own offerings, and other service providers also have that.

So that actually allows us to provide a solution that's a best fit for a business need. So we don't expect an enterprise will only go IZO. They're typically going to have a mix of solutions depending upon what they're deploying, the kind of applications they're deploying, the kind of offices that they're connecting and the kind of users that they're bringing on.

So to answer your question, there are competitors in each of the spaces and some of the solutions that we have obviously would compete. But then there's a price point and a use case for each one of these and there's a best-fit scenario that allows us to custom build it for the network for each of the enterprise customers that we have.

Mike Fratto

Okay. Great. So when you started your presentation, I didn't raise my hand, but I think you asked the question of is the internet mission-critical? Is it reliable enough for mission-critical traffic? And I didn't raise my hand, but I should have. I'm going to make the argument that for many organisations, for many use cases, it actually is. I can't remember the last time, at least within a single region, so North America, Europe, that the internet went down. And so while we're not getting quality-of-service guarantees, the availability is there.

So for an organisation that has multiple road offices, using business broadband, using leased lines, etc., it's generally good enough for internet connectivity. And you can use VPNs, layer-3 VPNs, IPsec, what have you, to interconnect the offices. So what I'm leading up to is can you talk a little bit more about the applications or the use cases that benefit from IZO compared to using just the plain old internet?

Amit Sinha Roy

Yes. So I covered a bit of it in one of the slides towards the end. I went over it very quickly. But applications like email clearly don't require or streaming video which can buffer, clearly don't require an SLA-driven deterministic routing. And it typically, if you have a good internet connection, you'll probably have great user experience. But when it comes to applications which are latency-dependent, like if we are doing a high-definition video conference, and I was doing one yesterday within our team and from the hotel, not this hotel, another hotel where I am, there was a bit of a jitter and delay which was coming in. I was connecting on our own VPN. And that's when you start wondering. And you can see because the tool that we're using, we're using Jamvee, Jamvee is the solution from TATA Communications for online video and collaboration. And it kept saying that network quality degrading, switching off video. So it can actually ramp up and down the services by figuring out what the network capabilities are.

So those are the kind of times when, if you need to have a critical face-to-face discussion and the video keeps somehow freezing and then going off and the audio gets a little jittery, it takes away the user experience. It takes away some of the effectiveness of that meeting as well. So there are applications which are latency-dependent which need guaranteed network performance. And that is where IZO

comes in. If it is something that somebody wants to browse or get email offline, then I think the internet is good enough for that.

Mike Fratto

You have a question?

Unidentified Speaker

Let me just answer that question. There's not a lot of money in that use case. I'm from a fairly major carrier. There's not a lot of money there. Where the money is at is when an enterprise has surplus money in the private cloud and they need to reach over to salesforce.com. They have a ton of users accessing their salesforce.com [instance] over the internet, which is perfectly fine. But when you think about the application servers you developed in house that need to make API calls, that is a huge business case, that pattern.

Walk down all of your cloud providers that are offering APIs and then walk down the customisations and integration hooks that the enterprises have to do with all of their cloud-hosted applications and now it is really huge. And now some APIs need to be real time. Some APIs can wait. Some jobs have to be done fast. Some jobs can wait. This is where you really need this type of cloud connectivity solution that's not just a plain vanilla DCI hook-up, my datacentre A with datacentre B and another trading partner over here which a lot of the datacentre operators are trying to offer.

But really, you go back to that use case. You've got your mobile workers. More than half the time their handsets and laptops are pounding in across the internet perfectly fine. Those requests can wait. But when the user of salesforce.com or some other cloud application is a server, now it's a completely different ballgame. And now it is absolutely hybrid cloud because the enterprises are running their app servers inside their private cloud environment.

Amit Sinha Roy

Yes. Thank you for that. So be it the AWS platform or they're running applications on the Azure platform as well as other platforms, like Salesforce that you mentioned, it allows the cloud applications also to interact together with the hybrid with the external world. And that gives you that level of performance in applications which are non-video. Absolutely. You're absolutely right.

Mike Fratto

So in that vein then, with cloud services and the point was well taken, there's four or five cloud services that are available now, how quickly can TATA add more cloud services, say one that isn't already listed, for example? How would they connect?

Amit Sinha Roy

So we are connected to multiple datacentres and we can connect to datacentres as required because we have a tier-one ISP network. So depending upon the business

case, it is possible. Of course there's a cost associated with bringing on new servers and services. And so we're looking at that space and adding on services as our customers need them. So it's not that the list is it. We're expanding the list, both in terms of locations, in terms of the service provider partnerships that we have as well as the services that we're bringing on, both from cloud service providers as well as our own datacentres and partner datacentres, such as Equinix.

Mike Fratto

Let me shift gears just a little bit. There's another set of what I would call competitors, with competitive technologies that are in this space. So we talked about [software buying] WAN, so products like from [Newage], Cisco's IWAN, VeloCloud, Silver Peak and others. What they're providing, those products provide the ability to create physical and virtualized instances so they can run in a cloud service, they can run in a datacentre, they can run in a road office, wherever, and provide that interconnectivity. And some of those products can even look at the network traffic performance, both on the physical layer and the virtual layer within a tunnel and make path selections if there are multiple paths out.

And they're using for many of the use cases that you're talking about, for real-time media, so voice, [slipping paths] for voice and video, for doing hybrid cloud connectivity, doing DCI, doing cloud-to-cloud connectivity. So they would say that they can provide a lot of that same functionality. They can't provide obviously the guaranteed latency end to end because they're using whatever the network is between there. But they can provide most of that functionality and good enough performance.

So again, where would you see IZO fitting in against some of those competitors?

Amit Sinha Roy

So I think the question is best efforts versus guaranteed. I think that's where it is. And there is a price. There's a price difference. But for the IZO end-to-end value proposition, it's not just the WAN connectivity. The WAN connectivity is something which is there. Beyond that, it is also the connectivity to the cloud service providers, to the datacentres, and not to forget out tier-one IP backbone, which gets leveraged and utilised to carry some of the critical information and the data.

All of this, together with security, where we allow managed encryption, right from the CPE over to the network for IZO, that gives a very, very compelling solution across connectivity, guaranteed performance and also the application availability. So there are three things which are given across the IZO stack. And I believe that there is no single competitor who plays in that entire end-to-end space. Each one of them has one of those areas.

Mike Fratto

So I want to shift gears just a little bit and talk about how do customers get access to the cloud servers? How quickly can TATA spin up a new service or add capacity or move capacity? What are some of those operational and billing issues?

Amit Sinha Roy

It depends on the location. It's all location-dependent. And it depends upon the service provider partnerships that we have in that area, if it is not something where it's directly on our network. And so it could take up to a couple of weeks to get the service activated. I think that's a typical turnaround time for service providers to get a connectivity in and running. So there's nothing which is way beyond the normal in terms of spinning it up. In most cases it is less than the average time to spin up an MPLS or last-mile connectivity that requires dedicated access because over here we're going over the internet. So IZO allows that.

IZO Private, if a customer opts for IZO Private, that requires the dedicated Ethernet or MPLS network and so that would require the standard time that is typically taken for installing one of those lines.

Mike Fratto

Okay. Great. So this launched in September of last year. Great. How would you describe the growth rate of adding new customers? And I know you talked about some of the use cases, but what are the primary drivers?

Amit Sinha Roy

So typically where we are seeing a lot of interest and a lot of uptake is where there is the hybrid cloud with the private and the public cloud coming in. We've seen a lot of interest in the banking industry. We in fact had a couple of sessions with one of our partners, with Microsoft, in fact, with customers. And there's a lot of interesting coming in for users of the Azure platform. They wanted guaranteed access across multiple locations. And the combination of TATA Communications network and the Microsoft Azure platform was a very compelling solution for them.

We also had similar sessions with the customers of Amazon, Amazon Web Services, across three locations. And again, very significant interest coming in for using the IZO cloud connectivity solutions. So that is something that we're seeing which is really taking off in terms of the ability to connect to these cloud service providers across applications which are both inside as well as on the public cloud.

And the internet WAN for customers who are looking at deploying multiple global locations across, but not really wanting to put in an MPLS network across all of them, so they're looking at more like a hybrid network. So they do have MPLS in some locations. But in other locations they are taking IZO. So these are the typical areas where we're seeing a lot of interest and a lot of uptake and signing on new customers.

Mike Fratto

Great. So in the case of using cloud, easier for a hybrid cloud scenario, what are the critical aspects? It's adjacent to what IZO does, but it comes down to automation and orchestration network provisioning, service provisioning, moving workloads back and forth. So can you talk a little bit about some of the capabilities for programmatic configuration and service delivery?

Amit Sinha Roy

So this uses the AS6453 protocol that's there with TATA Communications which runs on our backbone. And that allows us to be able to actually label the packets which are running across not only our network but our partner networks. So they are tagged. And using that tagging we are able to actually navigate through the internet with the deterministic routing. Even if we are encrypting packets, we use the encryption technology where we don't encrypt the header so we can still take the deterministic routing without having to go through too many overheads.

So these are the kind of technologies and solutions that we've put in at the back end to allow us to be able to traverse across multiple networks, multiple service providers, with a deterministic end-to-end performance.

Gint Atkinson – KVH Colt

Hi. This is Gint Atkinson with KVH Colt. I head up the network strategy team at KVH in APAC. So the interesting thing is what is the endpoint? Clearly with this type of direct connect style-based connectivity model, a lot of problems don't end at your port where you hand off to Amazon. In our case, we get a lot of trouble tickets and the customer says the traffic from our VPC is getting dropped. And sure enough, it's supposed to get dropped. They bought 100 mega and their virtual router is dumping a gig of bursts of 1 gig. So their layer three inside their cloud is not stitched into their cloud connectivity service correctly.

So I see an opportunity for the cloud connectivity provider to extend a virtual interface into the customer's VPC. This would represent an integration type of service. You have to come in and help the customer do something about their layer three network configuration inside the VPC. Now if you program into the Amazon APIs like we do, we go in there, we'll take the order for Amazon Direct Connect, we'll call the APIs, we'll spin up the connection, get the VLAN IDs from Amazon, bind it into our VLAN IDs on the service. But then the next step, of course, is to go even further and finish connecting or configuring the network environment for the customer.

The transactional value of making that next step and doing that integration work, do you possibly see that as a substantial opportunity for service providers like us that are in the cloud connectivity space?

Amit Sinha Roy

I would say absolutely, yes. That is a huge opportunity. And I know we're working together as well. So from that perspective, is it something which is there in the standard vanilla offering? No, it is not available today. Today it is just the endpoint which is there. But in terms of being able to integrate into the customer's network, into their layer three, into their applications, we have, in some cases, worked closely with system integrators who have deep knowledge of the applications that have been developed. So they are actually able to build those networks and the ability to build those linkages.

In fact, one of the partners, the system integrators we're working with was actually working on the Azure platform to build those linkages in for applications so that you have the end-to-end application performance as well, not just the network performance. So the answer is yes. In some cases we are also working with system integrators who have deeper knowledge of the application, because the application developers themselves would be able to then help out with some of the APIs to be able to build those bridges. So absolutely, yes.

Mike Fratto

So we have time for one last question. Anybody from the audience? Okay. So softball question for you. Where do you see TATA taking IZO into the future? What are the next steps, the next things that we're going to see coming to the service?

Amit Sinha Roy

So clearly one of the areas that is a must-have, it's a given, is the availability of the service across multiple geographic locations. So we're looking at how we can expand to over 100 locations where we can provide this service. So that's the big one in terms of being able to have coverage.

The point which is related to coverage is partnerships with service providers, because clearly that's the value add that is there. It's not about TATA only growing its network, but growing the capabilities together with our partners. So signing on new partners onto this service to be able to deliver this service together, that is another big, I would say, milestone for us moving forward.

And then be more innovative in terms of offering solutions, both from a cloud perspective as well as from a security perspective. So adding on more applications as well as making sure that the network security as well as the performance is continuing to keep pace with the requirements of enterprise applications. That's the third aspect. So it's very much partnerships, coverage and capabilities. These are the three things that we're looking at.

Mike Fratto

So when you say capability, like security, are you talking about security within the IZO network or are you talking about providing security services, like managed firewall, VPN, intrusion detection, monitoring, etc., out to the customer?

Amit Sinha Roy

Yes. So we have those solutions. We have the DDoS capability, unified threat management, UTM and managed firewall. So we have these services. Some of them are in partnership with leading global providers of these security services. So our networks allow us to be able to deliver these services to the enterprise customers. And also to be able to then blend that in with the IZO solution so that we can offer an end-to-end security platform as well.

Mike Fratto

Okay. Great. I think we're going to wrap up. Thank you very much for the talk.

Amit Sinha Roy

Thank you very much.

[End]